Telephony.

THE AMERICAN TELEPHONE JOURNAL

Comprising Telephony, American Telephone Journal, Telephone Weekly, Telephone Magazine, Telephone Securities, The Telephone, Sound Wave

PUBLISHED WEEKLY BY THE TELEPHONY PUBLISHING COMPANY
MONADNOCK BLOCK. CHICAGO

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Entered as second-class matter September 4, 1908, at the post office at Chicago, Ill., under act of March 3, 1897

Volume 69
Number 14

CHICAGO, SATURDAY, OCTOBER 2, 1915

Subscription—10 Cents a Copy
$3 a Year U. S., Cuba and Mexico
$4 Canada, $5 Other Countries

FULFILLING OBLIGATIONS THOROUGHLY.

The man who is working and strives perpetually to fulfill his obligations thoroughly, is continually building up for himself one of the greatest principles of morality and religion. Every blow on the anvil, or the earth, or whatever material he works upon, contributes something to the perfection of his nature.— Channing.

The Gospel of Service.

Not more than five years ago the suggestion that it is necessary to go out into the highways and byways and preach the gospel of service was regarded as a strange one, and those enunciating such a doctrine were considered with suspicion and not to be trusted with practical business affairs. But now the need for such procedure is universally felt by the heads of telephone companies as well as those of other utilities.

The utility and the community are mutually independent. Forcing a reduction of utility revenues, together with an increased cost of service where there is no possibility of effecting further economies, is more harmful to a city than to the utility. When a utility is prosperous, more men are employed, and this means more money in circulation and more food, material and supplies to be purchased. Thus the interests of the public and the interests of the public utilities are identical. What harms one, hurts the other.

That officials of public utilities appreciate this principle is evidenced by the plans for securing better relations with the public which are under consideration by such associations as the American Electric Railway Association, the National Electric Light Association and other organizations.

The men to make this movement successful must be of a different type from those who constructed the plants. It requires a diplomat—a man who understands human nature and how to lead it in the proper direction. In the last year or so, Bell and Independent companies have been making efforts to secure better public relations and some results are already apparent.

That the need for such efforts is not only appreciated by utility men but by others is evidenced by the thoughts expressed in a recent book, "The Reconstruction of the Church," by Dr. Paul M. Strayer. He states that the belief, "the law of service is fundamental to business whose very existence depends on the maintenance of certain moral principles," has come to be a part of the twentieth century economic and social creed. Emphasizing the fact that "business rests upon the discovery and the supply of social needs," Dr. Strayer says:

"Perhaps most men would say that they are in business for the money and not for the purpose of performing social service; and yet the laws of business are such that a man must render service to the community or the community will have none of him. . . . If a business does not serve some social need it is uneconomic and useless, and will soon be cast aside."

Only recently in an address on "Co-operation" Judge E. H. Gary, of the United States Steel Corporation, stated as his belief that fundamentally the European war was made possible by the failure of men and women constituting great population to insist upon the application in respect to their economic activities and interests, of the simple Christian principles of mutual forbearance and co-operation which they avow as their religious or social creed. This, it will be observed, is only another way of stating what Dr. Strayer sets forth, as quoted above.

In preaching the gospel of service in order to secure better public relations, publicity is a valuable factor. Methods which have been found to produce results by public utilities may be summarized as:

Readable annual reports; pamphlets on specific subjects; reading notices in local newspapers; formal newspaper advertising; addresses delivered to civic organizations and especially to high school students, departmental meetings or schools, reports of which filter into the newspapers; and posters and hand-bills for emergency notices.

Lack of Confidence and "The Revival of Business"

First of a Monthly Series of Articles Written with a View of Helping Readers to Think, by Supplying Fundamental Information Rather Than Conclusions—The Present Need for Promoting Future Business—Courage and Confidence—Conservative Action vs. Idle Waiting

By Frank M. Huston, *Financial Editor, Chicago Evening Post—Editor, Rand McNally Bankers' Monthly*

What is Needed in This Country Most at the Present Moment, is Some of the Old, Indomitable Courage in the Business World. Because There Seems to be no Precedent to be found in History to Act as a Financial Guide in the Present, Many Seem to Be Disposed to Pause and Allow a Golden Opportunity to Pass. A Few Long Headed Courageous Men are Quietly Taking Advantage of the Lull to Build Future Business.

It was the late J. Pierpont Morgan who made a remark a few years ago that has since become almost an axiom, warning people never to become a bear on the possibilities of this country. Mr. Morgan had the courage of his convictions and the son is following in his father's footsteps. He and other banking firms, such as Kuhn, Loeb & Co., are taking advantage of existing opportunities in arranging for a large credit for the European belligerent countries here, thus performing a greater service than most people imagine. These banking firms are not to be considered philanthropists. They are performing a service, it is true, but as a matter of fact they are good, far-sighted business men.

There is a big profit in this war banking and they propose to get that profit. *In getting it they are bringing this country a large volume of business that we need to keep our mills in active and continual operation,* in a time of lax domestic business. But is this lax business, this restricted activity, really justified, even with the greatest war in all history under full sway in Europe? Let us see.

It is true this war is destroying a very large amount of property, of wealth. This property, or wealth is the basis of credit. It is not necessarily money. It is certainly not reserve money—as accepted in most nations of the world—that is being destroyed. In fact, practically no gold has been destroyed in this war, while gold accumulations as reserve have increased. Gold that has been hoarded has come out of hiding and gold used in the arts (jewelry, etc.), has been turned in and exchanged for credit.

Thus it will be seen that reserve money has increased while wealth has decreased, to the extent of the property destruction and the destruction of munitions of war and curtailed activity. Contraction of wealth means ultimately a contraction of credit.

Just now, however, reserve money is accumulating and being hoarded in Europe and this makes possible an enormous inflation of currency. A government in times of stress uses its credit just as does the individual or corporation. This is sound financing, providing it is not carried beyond actual needs. Sound principles of finance require that deflation take place as fast as the requirements for use of the credit pass.

Increased currency emissions and rapid circulation stimulate business, over-inflation brings currency depreciation. This is what Europe is now experiencing.

In this country we expanded our currency to meet the requirements of business here when our international credits became temporarily of no use as a banking asset. The moment that condition cleared, the emergency currency was retired. Our currency, therefore, is deflated until it is now in about normal volume.

This country, therefore, is in a fundamentally sound position to meet any shock that might come out of the war. Our crops are very reassuring—a large yield of wheat; a big crop of corn and oats and other cereals will add something like $9,500,000,000 *to our wealth. This is a basis for nearly* $30,000,000,000 *of new credit.*

This means additional buying power in the agricultural sections and the small towns. This additional buying power, together with the benefits accruing from the war orders, affording employment to thousands of artisans, means the consumption of more merchandise of every sort, more building, more business for the carpenter, the plumber, the supply man, the brickmaker, the hardware merchant, and so on down the line. In fact, all lines of trade will be stimulated in consequence.

For many months excess conservatism on the part of various lines of trade and of the consumer, has resulted in a hand-to-mouth buying policy. With fundamental conditions sound, and with the necessity growing for a replenishment of many of the necessaries, there is every reason to look forward to a gradual expansion in business.

What is needed at the moment are courage and confidence. It will not do to sit idly by waiting for the economic readjustment that will follow the war. That may be years in developing, and when it comes, we will be better able to accommodate ourselves to that new condition because of our having proceeded in the meantime conservatively, but in a courageous way, to care for the business that is at hand. Speculation, of course, is to be avoided, but there should be no fear in reaching out for legitimate business in various ways. The resumption of business depends upon the confidence and the courage to reflect it in business intercourse, and one may well base this confidence on the good physical and financial condition of our country.

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Fundamental Principles of the Telephone Business

A Reading Course Designed to Present Logically the Principles Which Underlie Successful Organization and Operation of Telephone Properties—Prepared Under the General Supervision of Stanley R. Edwards—Part I, Telephone Economics, by James H. Shoemaker, Completed June 26, 1915—Part II, The Corporate Telephone Organization, by J. C. Kelsey and S. R. Edwards, Completed September 25 Part III, Telephone Accounting and Auditing, Written by James H. Shoemaker

[EDITOR'S PREFACE: With this issue, Part III of the reading course, "Fundamental Principles of the Telephone Business," is commenced. It takes up a subject which is of great interest to telephone managers—that of "Telephone Accounting and Auditing." It is not intended to go into all the details of bookkeeping, but to consider the subject from the point of view of the manager and discuss essentials of accounting about which he should have some knowledge.

The author of this part of "Fundamental Principles of the Telephone Business" is James H. Shoemaker, who was for many years general manager of a group of Independent telephone companies. Mr. Shoemaker is therefore familiar with the accounting problems which managers generally encounter.

In the preparation of the matter on accounting and auditing, Mr. Shoemaker has the assistance of an experienced telephone accountant—one who spent a number of years on corporation accounts and the keeping of materials and supplies before entering the telephone business. He is a practical man and before taking up accounting studied for a career of electrical engineer. His knowledge has been acquired through the home study school and the college of practical experience. He has had a dozen or more years of the most practical accounting that it is possible for any man to have with telephone companies. This experience includes service with companies operating from 1,000 to 20,000 telephones and has involved researches into many systems of telephone accounting, including those of several state commissions and the Interstate Commerce Commission.

TELEPHONY's editors believe that Part III of "Fundamental Principles of the Telephone Business" will be of interest and benefit to managers and all others interested in the business end of the telephone industry. Surely no telephone executive should have to confess to a lack of knowledge of correct accounting principles.]

CHAPTER I. Introduction.

1. *Use of Telephone Accounting Systems.*—A convention of telephone managers was being held. About a hundred companies were represented. The subject of accounting was up for consideration.

"Let us see what proportion of the companies represented here are now using the accounting system required by the Interstate Commerce Commission," suggested one of the members.

"Will the representative of every such company please rise and remaining standing?" requested the presiding officer, acting upon the suggestion.

Twenty men—about one-fifth of those present—rose to their feet.

"How many started the new plan without any help from the outside?" asked the member who had proposed the subject.

Only one out of the twenty had gotten along without help. That one was the member who had asked for the discussion—he had been an expert accountant before becoming a telephone manager.

"From what source did you obtain help?" "What system are you following?" were the questions asked of each one who was standing.

It was learned that all the companies had gone to the same source for help. Every company was using the ———— system. Even the manager who had been an expert accountant had himself adopted that same system. He said it was as good as any, and it saved him the trouble of doing a lot of work which had already been carefully thought out.

2. *Benefits from Proper Accounting Methods.*—"Are you well pleased with the results which you are getting?" was asked next.

Everyone said he was as well pleased as could be expected. "But," said a member, "this word of explanation should be given."

"Changing from any bookkeeping system to something different is like changing from an old to a new pair of shoes. It is like having a tooth pulled. Everybody needs the kind word which the dentist offers when he says: 'It will feel better when it quits hurting.' Starting in on this matter is like eating olives. One must eat three before he begins to like them. And your company will have to keep its new records for three or four years before it begins to get all of the benefits of the better method.

"Do not expect to enjoy the change. You did not enjoy the first olive nor did you like having your tooth pulled. But it is worth a thousand times more than it costs. Try to think how glad you will be when the troublesome part is over and you have facts, instead of fancies, behind your opinion as to whether the business is a paying or a losing game.

"If some irresistible power had made us all use this new method of accounting from the beginning, every company would now be receiving a living rate, instead of meeting, as we are doing today, to figure out how to get rates up to a basis that will be reasonable."

3. *The Hardest Account to Understand.*—"What were the

two or three hardest things with which each of you had to contend at the outset?" asked the expert accountant.

"It is all right to keep in mind the fact that we will feel better in a year or two," said a member, "but when you are on your way to the dentist's office, the certainty of pain is uppermost in your mind." Continuing, he said:

"The hardest thing for me, at first, was this: I could not understand why I should have a separate store. I could not see why every cent's worth of my company's material and supplies had to be bought by a separate store, nor why every pole, cross arm, battery, telephone, etc., *had to be bought from our own store on the very day it was actually put into use in the plant.*"

"I had exactly that same trouble, at first," said number two. "But we do not have a separate store. We have only a separate *account* which we call 'Material and Supplies.' Our company buys all its own materials and supplies exactly the same as before.

"The difference between the new and the old way is this: When we credit cash or a supply house with the cost of an article, we debit 'Material and Supplies.' The books show the investment as being in material and supplies until the actual work reports show that the material or supplies have been put into the plant or used as a part of its operation. When that happens, when the article actually is put into use, we credit our 'Material and Supplies' account and debit the account of the particular thing for which it was used."

"Why, of course!" exclaimed number one. "That is exactly what we do. We may call your 'Material and Supplies' account by the name of 'Store'—I am not sure, myself, as to the particular name which we are using—but our practice is exactly like yours. I spoke about the separate store because, in the long run, that is just about what it amounts to. I gave you my experience in that extreme language. I wanted to make as plain as possible the most troublesome thing with which I had to contend."

4. *Prejudice Against Proper Accounting Methods.*—"The worst thing I had to overcome," continued number one, "was myself. I had a tremendous dislike for what I termed unnecessary red tape. I had fought for years against what I called 'the nonsense of the bookkeeping theorists.' I had argued in this way: "Those theorists have never dug a hole, strung a span of wire, sold a share of stock, struggled against the competition tricks of a rival company, nor have they ever satisfied the demands of a city council or a list of subscribers.

"I was sure that I had the best argument in the world. It was no trouble at all to prove, to my own satisfaction, that for me to take time away from what I considered the more necessary and more practical duties, would be *contrary to common sense.* Why, the very idea! It would take a whole month of my most valuable time (away from ball games, etc.) to make myself familiar with the meaning of the big words used in the uniform accounting instructions.

"Why should I waste time trying to learn the definitions of such words? 'They were invented,' said I, 'by good-for-nothing theorists to hide their own ignorance—to cover up their own inability to master the mysteries which they pretend to explain to others.'

"I took the trouble to go to our state capitol. I had a visit with the public utility commissioner whose name was signed to the instructions I had received relative to this matter of uniform accounting. And you should have seen me swell up with pride when he, himself, could not give correct definitions to more than half of the big words I had marked out in his pamphlet of instructions.

"I got him to admit, also, that his state commission was unable to agree with the Interstate Commerce Commission about certain more or less important points. Finally he admitted, frankly, that he could not be expected to understand all the details of the instructions, because he was not an expert in matters of that kind. This commissioner actually owned up to me that his own instructions were too much for him. He admitted that the state had employed a $5,000-a-year accountant to arrange the plan and write instructions.

"You can imagine how proud and self-satisfied I was when I fired at him such questions as these: 'Do you expect me to know more about expert accounting than you do? Must my company hire a $5,000-a-year man, also, to put into operation the scheme which has been hatched up by your $5,000-a-year expert?'

"But, after a few days a different feeling began to creep over me. I soon commenced to realize the fact that my arguments had not repealed the law. I quickly saw that if I did not find out what the instructions meant—or, if I failed to keep our company's books in the way that was demanded—I would be punished for violation of law. I found, to use a slang phrase, that I was actually 'up against the real thing' so far as this uniform accounting proposition is concerned.

5. *Uniform System of Accounting Obligatory.*—"From the Interstate Commerce Commission's Instructions, issue of 1915, I read: 'The act to regulate commerce, as amended, invests the commission with authority to prescribe the forms of accounts to be kept by telephone companies subject to the act, *and prohibits the use of any accounts other than those prescribed by the commission.*

"'*The observance of the rules and regulations* stated in this system of accounts *therefore becomes obligatory.*'

"As usually happens in cases of this kind, I went, finally to the best friend I could think of, who claimed to be succeeding in the keeping of the required accounting system. It was this friend who made me see the point about the store and the work reports, which I said were the hardest things to submit myself to—at the start. He made me see that the cost of everything must be carried in the store account until, by actual usage, it is possible to know and to show on the reports whether it is chargeable to 'Expense' ('Operation,' some called it), or to 'Construction and Betterments' (which is investment or capital as distinguished from operation or expense), or to 'Reserve' (which includes everything done in the way of reconstruction, etc.).

6. *Importance of Proper Kind of Help.*—"It was this friend who made me see that I *must employ the kind of help that can, and actually will, report in a reliable manner* the exact place at which, and the exact purpose for which, every expenditure for wages, material, supplies and incidental outlays are used.

"It is the easiest thing in the world to say: 'Help of that kind can not be found,' on the one hand, or 'the help which one has cannot be taught to do these new fangled stunts,' on the other. But enough companies are now actually keeping accounts reasonably near to the standard of requirements to make such talk a mere waste of time. Your company and mine must either 'get in line or get out.'

7. *Foundation of Successful Accounting.*—"The best accounting scheme in the world would be unreliable and valueless unless it was built upon this foundation of a complete stores account, coupled with a thoroughly reliable system of work reports showing accurately the amount of every expenditure, its specific purpose and the exact place where it goes into the plant or its operation."

8. *Uselessness of Opposition to Proper Accounting Systems.*—"How I wish I might have attended a meeting like this a year ago! I am sorry I did not hear the experience of some one related as Mr. Smith just told his," said number three.

All the others in attendance at the meeting acknowledged they had gone through the same struggle with themselves—the struggle against the idea of keeping the stores or material account and the making of daily work and "material used" reports.

Continuing, number three said: "If I could have heard some practical manager of my acquaintance acknowledge that he had finally been 'brought to it,' I would not have wasted so much precious time myself fussing around to find some easier way. I rebelled against the 'stores account' and the 'work reports' for a long time. I thought out, for my own satisfaction, a whole bookful of inconsistencies which I charged up against the 'accounting faddists,' as I called them. And, in this spirit of opposition to the inevitable, I did my company a lot of harm."

"The most important thing is to get the manager to see first and then to get the help to see, also," said number four, "that the stores account can not be evaded and that the work reports must be made." *(To be Continued.)*

San Francisco Convention of Independent Association

Program Includes Papers and Addresses by Prominent Telephone Men—Itinerary of Special Train From Chicago—Opportunity to Visit the Expositions at San Francisco and San Diego and Also Independent Plants on the Pacific Coast

Arrangements for the convention of the Independent Telephone Association of America, to be held at San Francisco, Cal., October 26, 27, 28 and 29, are now nearing completion. An interesting and instructive program is being arranged. Among the subjects to be discussed in addresses and papers, are the following:

"Measured Service," by E. P. Morphy, secretary of the Home Telephone & Telegraph Co., of Los Angeles.

"Proper Relations between Municipalities and Public Utilities," by Chas. E. Sumner, president of the San Diego Home Telephone Co.

"Past, Present and Future," by E. B. Fisher, of Grand Rapids, Mich., president of the Independent Telephone Association of America.

"Co-operation," by A. Wardman, of Whittier, Cal., secretary of the California Independent Telephone Association.

"Efficiency or Inefficiency, Which?" by Chas. A. Rolfe, of Redlands, vice-president of the Southwestern Home Telephone Co.

"The California Cable Bug," by Albert Schuler, manager of the Home Telephone & Telegraph Co., of Santa Barbara.

"Commission Regulation from Class C Standpoint," by T. A. Gould, of Redondo Beach, manager of the Redondo Home Telephone Co.

"Commission Regulation of Telephone Companies," by a representative of the California Railroad Commission.

There will be several other numbers on the program, arrangements for which have not yet been completed.

Route of Special Train.

Recent reports indicate that there will be a good attendance from the Western states, expecially California, Oregon and Washington. The association recently sent out 2,500 itineraries of the proposed trip, which have brought forth a number of inquiries from telephone people in the Middle West and Eastern states. The association plans to have a special train of at least 125 people aboard when it leaves Chicago at 10:30 on the evening of October 21.

The train will go over the Rock Island Lines via Rock Island, Davenport, Des Moines, Omaha, Lincoln and Colorado Springs, arriving at Colorado Springs at 7:15 a. m. Saturday, October 23. A stopover of five and a half hours will be made at Colorado Springs, one of the most beautiful home cities of the West, with broad streets and magnificent residences, with Pike's Peak and Cheyenne Mountain on the west. Some of the most noted side trips which can be made from this point are a trip up "Pike's Peak," "South Cheyenne Canyon and Seven Falls," "Garden of the Gods," "Crystal Park Auto Trip," "The Cliff Dwellings," "Cave of the Winds" in Williams Canyon, "The High Drive," "Mount Manitou Incline," and many others.

The special train will leave Colorado Springs at 12:45 o'clock noon, October 23, passing through the famous Royal Gorge in the afternoon; then on over Tennessee Pass over the Continental Divide, the crest of which is pierced by a tunnel half a mile long, the south end opening upon the western slope. The special train will arrive at Salt Lake City, Utah, at 1:30 o'clock p. m., October 24, where a stopover of about three hours will be made. This portion of the day will be spent in a free-auto-sight-seeing trip. Salt Lake City affords many points of interest, among which are the Mormon Temple Gardens with the great Tabernacle and Assembly Hall, located on Temple Square. Here an opportunity will be given to hear the famous pipe organ.

The special train will leave this city at 4:30 p. m., Mountain time, or 3:30 p. m., Pacific time, proceeding westward on the journey over the Western Pacific Railway. The special train will follow the Feather River Canyon, the scenic beauty of which is unsurpassed in any place in the world, and will traverse 117 miles, passing through 47 tunnels, arriving at San Francisco, at 8:30 p. m., October 25.

It will be possible for those desiring to attend the convention to join this train anywhere en route. The management of the Gregory Tours will do everything possible to make the journey pleasant and convenient. Upon arrival at San Francisco, it will see to the transferring of the baggage and assign-

ing of rooms at Hotel Plaza in such a way that there will be no delay or confusion to members of the party.

The seven days spent at San Francisco bid fair to be seven busy days. The convention itself with four half-day sessions, the telephone exhibits in the Exposition Hall, the visits to the Panama-Pacific International Exposition, the numerous side trips that have been arranged, including a trip to Mt. Tamalpais, a steamer trip on San Francisco Bay, a trolley trip through Oakland, Alameda and Berkeley, and a night trip through Chinatown, will keep all well occupied.

Those attending the convention will, of course, wish to take advantage of the opportunity to visit Los Angeles, as well as the Exposition at San Diego. Numerous invitations have been received by the association to visit these different places. At San Jose, the business men's organization has invited the entire party to take a complimentary trip with its members through the great Santa Clara Valley. The Home telephone companies at Los Angeles and San Diego have cordially invited all to visit their exchanges.

All who have given this matter thought agree that this is an exceptionally fine opportunity for telephone people and their friends to visit the West and to see the country. The expositions enable one to see quickly the great improvements that have been made throughout the world in recent years. It is a splendid opportunity to combine business and pleasure.

Examination for Junior Telegraph and Telephone Engineer.

The United States Civil Service Commission announces an open competitive examination for junior telegraph and telephone engineer on October 20, 1915. From the register of eligibles made up as a result of this examination, certification will be made to fill vacancies as they may occur in these positions in the Interstate Commerce Commission under the act providing for the valuation of the property of common carriers, unless it is found to be in the interest of the service to fill any vacancy by reinstatement, transfer or promotion.

The following positions established under the above act will be filled from the register resulting from this examination: Junior telegraph and telephone engineer, Grade I, $1,200 to $1,680 a year. Junior telegraph and telephone engineer, Grade II, $720 to $1,080 a year. Appointments to these positions will be principally for field service.

This examination is open to all men who are citizens of the United States and who meet the requirements.

The requirements are specified in the announcement issued by the commission. Persons wishing to take this examination should apply for Form 2039, stating the title of the examination, to the United States Civil Service Commission, Washington, D. C., or the secretary of the United States Civil Service Board, at any of the postoffices where the commission has a branch.

An examination for junior electrical engineer will also be held on October 20 at the same time as are listed for junior telegraph and telephone engineer. Anyone interested in this examination may obtain further information by applying for Form 2069 stating the title of the examination for which the form is desired.

Wireless Telephony Across the American Continent

Radio Telephony Successfully Used to Communicate Between Arlington, Va., and Mare Island, San Francisco, Cal., Approximately 3,000 Miles—Conversation Transmitted from New York to Arlington Over Wire Lines and Thence Across Continent by Radio System

Transcontinental wireless telephone communication was accomplished for the first time in this country Wednesday, September 29, when experiments extending over several months culminated in successful transmission of the human voice by radio from the great naval plant at Arlington, Va., across the continent to the station at Mare Island, near San Francisco, Cal., about 3,000 miles away.

The experiments were conducted under direction of Capt. Bullard, chief of the navy's radio service, in co-operation with the American Telephone & Telegraph Co., and the Western Electric Co. Secretary Daniels, announcing the result, predicted that further development of wireless telephony would make great changes in long distance communication, both for military and naval service and commercial usage.

Land Wires and Radio System Linked.

Successful operation of a device for automatically transferring to the radio, telephone conversations originating on metallic circuits also was accomplished in the tests. President Theodore N. Vail and other officials of the American Telephone & Telegraph Co. at New York, talked easily with the Mare Island station, the conversation traveling over an ordinary metallic line from New York to Arlington and thence by radio across the continent.

In the first experiment Wednesday, the voice was successfully transmitted by radio to Mare Island, from Arlington, the return answers and communications being made over the transcontinental land telephone line. This was successfully accomplished in the presence of officials and engineers of the Western Electric Co., a representative of the signal corps of the army, representatives of the technical and operating departments of the Navy Department and a few other interested parties.

After this successful demonstration, conversation originating in New York was transmitted over the land wires to Arlington, Va., there automatically connected to the radio transmitter, which carried the voice to Mare Island, Cal., where it was clearly and distinctly received. Answers and other conversations were from there transmitted over the transcontinental line to the originating office in New York.

The conversation was carried on from New York by President Vail, of the American Telephone & Telegraph Co., Vice-President U. N. Bethell, and John I. Waterbury, one of the company's directors, while at Mare Island were officials of the Navy Department, John J. Carty, chief engineer of the American Telephone & Telegraph Co., and representatives of the Western Electric Co.

"The fact that the voices can be started on a land wire and automatically transmitted to a voice radio transmitter," Secretary Daniels said, "holds out hope that persons inland can readily be put in touch by telephone with others at sea through some central transmitting station."

The navy department issued a formal announcement of the success of the experiments, concluding:

"Every official taking part in this demonstration is enthusiastic about the results and the possibility of developing this system as an extension of the telephone system to ships at sea."

Predict Talking Around World.

The transmission of audible speech to Europe by wireless can be taken as an assured fact, in the opinion of telephone officials in New York, who added that it would have been attempted before this but for the European war. They declared that talking from New York across the Atlantic, and from New York to Japan, is now only a matter of installing the necessary apparatus.

Independent Telephone Companies of Southern California

Some Interesting Facts Relative to the History and Operation of a Few of the Southern California Independent Companies, Including the Oxnard, Pomona Valley, San Diego, Redondo, Ontario & Upland, Whittier and Downey Companies

The Expositions at San Francisco, and San Diego, Cal., have attracted many telephone men to that part of the country this year and still others will journey there next month during the convention of the Independent Telephone Association of America. From the Independent telephone companies operating in Southern California TELEPHONY has obtained photographs and some interesting facts relative to their history and operation. All of the Independent telephone companies operating in places through which telephone men may pass are glad to welcome visitors, and some have extended special invitations.

Of particular interest will be the plant of the Home Telephone & Telegraph Co., of Los Angeles, the operation and equipment of which is fully described in a paper by W. Lee Campbell which was presented at the Panama-Pacific convention of the American Institute of Electrical Engineer, held at San Francisco on September 17. The concluding installment of this paper appears on other pages of this issue.

OXNARD HOME TELEPHONE CO.

The Oxnard Home Telephone Co. began the construction of its plant in Oxnard, Cal., in the summer of 1905, and the first of the following year commenced operating with about 200 subscribers. F. M. Coker, who is now manager of the Dean Electric Co., of San Francisco, Cal., was the first temporary manager. He was succeeded in 1906 by Chas. M. Sickels, the present manager, who was the first manager of the Citizens Telephone Co., at Adrian, Mich.

The Oxnard plant now has 975 stations, 275 of which have magneto selective ringing and 700 of which are common battery city lines. The magneto lines give direct exchange service for ten or fifteen miles around in three valleys: To Hueneme, four miles, a seaport; Camarillo, ten miles; Somis, 13 miles; and Las Posas Valley, 12 miles. The company connects with the United States Long Distance Telephone & Telegraph Co., of Los Angeles.

The plant was first built and owned by the Pacific Coast Construction Co., of Los Angeles, but two and a half years ago it passed under the control of Francis H. Crosby, of San Francisco.

This system is located in a wonderfully rich and productive valley in which it thrives. Its home office, Oxnard, is known as the "Biggest Little City on the Coast." Oxnard is the home of the largest beet sugar manufactory in the world, now grinding 3,000 tons of beets a day and converting them into over one million pounds of fine granulated sugar. This is also the center of the lima bean industry of the country, the association's main offices being located in Oxnard.

POMONA VALLEY TELEPHONE & TELEGRAPH UNION.

The Pomona Valley Telephone & Telegraph Union, Pomona, Cal., holds the record for having more telephones for population served than any other community in the United States. The last United States census also reported the Pomona company as having the lowest average rate for telephone service in the United States. Over 4,600 telephones in a district of 17,000 people tell the story.

The Pomona Valley, because of varied interests, is peculiarly adapted for a steady, prosperous condition of business. The telephone company has four branch exchanges with free trunking service at the following points: Claremont, the seat of Pomona college, one of the leading educational institutions of the west; Chino, with its large sugar beet industry and extensive alfalfa lands; San Dimas and Lordsburg, both centers of large citrus interests.

Even with its low rates the Pomona company has been one of the best and safest financed telephone companies in the state. The state railroad commission, in a recent hearing concerning a bond issue, spoke in an unusual way of the splendid financial condition of the company's affairs, and the presiding commissioner stated that it was a pleasure to examine the affairs of an institution with its business carried on in such splendid shape.

The Pomona company has taken a lead in new improvements. It was the first company on the coast to extensively adopt the harmonic system. It converted its entire plant to this system in 1906, making one purchase of 1,200 new instruments. At present the company is engaged in install-

Some of the Operators of the Oxnard Home Telephone Co.—View of the Building in Which Exchange Is Located.

ing all the late features and improvements in the manual switchboard, it being the first company west of the Mississippi to commence the installation of the new Kellogg cord circuit, including the latest improvements in automatic ringing, automatic listening, secret service, automatic disconnect, instantaneous recall and automatic peg count. Along with these features it has just completed changing its entire system of answering and multiple jacks to a multiple lamp-call distributing system. The installation of the new equipment is now being done by W. E. Johnson and C. F. Jackson, the company being fortunate enough to have men in its regular force capable of doing the job efficiently.

The officers of the company are: President, F. W. Thomas; vice-president, J. A. Dole; secretary, A. M. Dole; treasurer, C. E. Walker; attorney, R. K. Pitzer; and manager, D. S. Parker. The heads of departments are: Carl H. Lorbeer, wire chief and assistant manager; W. E. Johnson, assistant wire chief; E. Varcoe, line foreman, and Miss Ada Egbert, acting chief operator.

The San Diego Home Telephone Co.

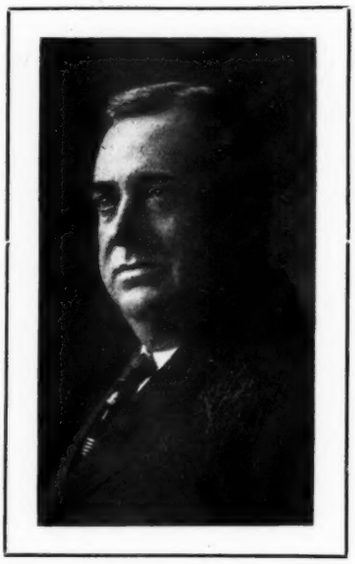
In 1903 Charles E. Sumner came to San Diego from Toledo, Ohio, and interested local capital in the promotion of an Independent telephone company in a field which had been monopolized by the Bell interests for approximately seven years. The San Diego Home Telephone Co. was organized, and an adequate telephone system with automatic service put into satisfactory operation. After the system had been working successfully for some time Mr. Sumner resigned as president to go into Oregon and Washington in the interest of the Independent telephone business.

For a number of years the San Diego Home Telephone Co. enjoyed a full share of the telephone patronage of the city, but while San Diego was doubling her population in the last four years the company did not live up to an aggressive policy, and consequently did not grow proportionately with the city. In the meantime Mr. Sumner had returned to San Diego and taken up an active legal practice, and in June, 1915, the board of directors met and asked him to once more accept the presidency of his old com-

Two of Current Series of Advertisements of San Diego Company.

pany, in the hope that he would again put this company in the lead.

One of Mr. Sumner's first moves was the inauguration of a co-operative policy, described in a previous issue of Telephony, which he had evolved as a spectacular, but thoroughly feasible plan, for attracting new subscribers to his banner, and turning the tide of public sentiment in favor of the "Homephone." The revolutionary policy provides that all earnings of the company, in excess of 3 per cent. per annum on the capital stock, shall be pro-rated to the subscribers. Thus the rates are automatically regulated, and the user of the telephone is assured of the best service possible, with no danger of service being slighted in the interest of profits. That the experiment is proving successful is evidenced by the prompt response the public is making, which is shown by the new business coming to the Independent company. During the vacation month of July, when the "take-outs" are usually in excess of new installations, the new telephones installed showed a 100 per cent. increase over those ordered out.



C. E. Sumner.

While the co-operative scheme was instituted as soon as Mr. Sumner took office, it is interesting to note how he evolved the plan from his years of experience in the telephone field. He explains the growth of the idea as follows:

"Corporations organized solely for profit conduct their affairs with an eye singly to increase profits.

In telephone operation the largest returns will be realized by locating the exchange in densely populated business centers, and by serving the people within such districts, thus dispensing with expensive leads, curtailing the cost of construction and minimizing the amount of investment. This leads to contracting the service, and telephone users do not get the advantage of extensive connections.

In developing Independent telephony in Oregon and Washington I contended that in order to have an efficient service we must have competing systems or municipal ownership.

I was engaged from 1903 to 1906 in establishing telephone competition in the great Northwest, and while I have never been able to make myself believe in the doctrine of municipal or government ownership of public utilities, yet in all of my franchises I had inserted a clause providing that at the expiration of ten years the municipality might acquire the property built and operated under the provisions of such franchise.

I sincerely contended that in order to have one good system it was necessary to have two, unless the one was a municipal plant. With larger experience, and upon more careful study, and imbued with the modern doctrine of co-operation, which has recently entered into many commercial enterprises, I now take the position that one system under proper conditions is preferable to two, and that it is not necessary that such plant be municipally owned and operated. I have worked out a co-operative policy, which does away with the necessity of competition, by taking away from the corporation any incentive to slight service in order to increase profits. Instead, the subscriber receives any excess profits over a certain prescribed amount.

In the case of the San Diego Home Telephone Co. a majority of the stock, as well as the bonds, is owned by citizens of San Diego. It is, therefore, locally owned, controlled and operated. It is equipped with the most modern devices for furnishing quick, secret, efficient and economic service. The stockholders and bondholders have supported

me in the inauguration of a new business policy, which gives the best possible service at the lowest possible cost.

In order to protect the subscriber against excessive salaries or undue expenditure, I propose that they shall be represented upon the board of directors, thus placing them in close touch with the business affairs of the company, giving them a voice in its management, and assuring them of a square deal under this new plan. Directors so representing subscribers can prevent payment of such salaries or other illegal and unlawful expenses, and guard the interest of the patrons.

If I receive the support which local interprises particularly deserve, and which this new, broad business policy merits, I will furnish the largest and most efficient service and

—"Keep Home-made Money Home"—
Straight Talks to the People
You Get What You Want When You Want It!
Get the Most For Your Money!
HOMEPHONE supplants Pacific
HOMEPHONE is modern
HOMEPHONE is best
HOME PHONE for Business Men
HOME PHONE "Cuseless" Centrals
HOME PHONE Superior Service
HOME PHONE costs less
HOME PHONE gives more
Co-operate with HOME PHONE
Charles E. Sumner
President San Diego Home Telephone Co.
THE DEADLY PARALLEL
What Pacific Does—and What Home Phone Does With Your Money!
There's No Place Like Home For Your Money
HOME PHONE Talks to You
Don't Sacrifice Yourself
Be Loyal to Home
Pacific Takes It Away
Home Phone Keeps It Here
Then Patronize Home Phone
"Private Line—Secret Service—Residence Phone $1.50"

Some of a Series of Advertisements of the San Diego Home Telephone Co. Featuring a Locally-Owned Enterprise.

return to the subscriber an amount which will greatly reduce the cost of service to telephone users."

The San Diego company did considerable newspaper advertising in July. In August a series of statements were run over Mr. Sumner's signature. Some of them are reproduced in the accompanying illustration. There were eight advertisements in this series. Last month another series was commenced under the title, "Fighting the Telephone Trust," the first two advertisements of which are reproduced here. The first advertisement as will be noticed summarizes the thoughts given in the first series. The effect of this advertising campaign is already being seen in the subscribers' list of the company.

Redondo Home Telephone Co.

The Redondo Home Telephone Co., of Redondo Beach, Cal., was organized in 1905 by C. P. Platt, Chas. L. Zahm and C. F. Guthridge. These men were among the pioneers in the Independent telephone industry in Southern California, having established a number of smaller companies in this section at a time when there was a great demand for telephone facilities and the Bell companies were not extending fast enough to satisfy the public.

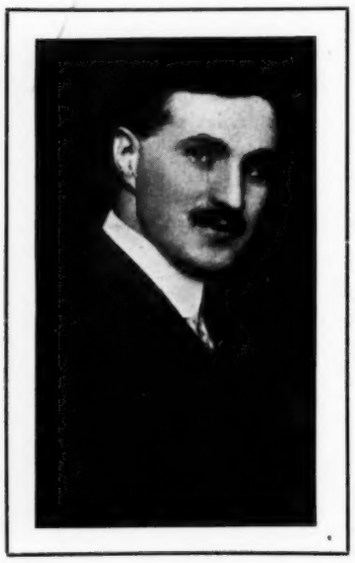
The Redondo system is a common battery plant with 350 telephones installed. It operates in Redondo Beach and Hermosa Beach, connecting with the United States Long Distance Telephone Co., and competes with the Pacific Telephone & Telegraph Co., which also operates a common battery exchange at Redondo Beach.

T. A. Gould, former secretary and general manager of the Ellis County Independent Telephone Co. and the Central Toll Line Co., at Ennis, Texas, for six years, assumed the duties of president and general manager of the Redondo Home Telephone Co., in May, 1914. Under his supervision

the service has been greatly improved and the number of subscribers increased.

ONTARIO & UPLAND TELEPHONE CO.

The Ontario & Upland Telephone Co., Ontario, Cal., was organized in 1912 for the purpose of taking over the plants of the San Bernardino Valley Telephone & Telegraph Co. and the Pacific Telephone & Telegraph Co., which previous to that time had operated in competition with each other in Ontario. The new company commenced operations in March, 1912, and has ably demonstrated to subscribers that one system is sufficient if it gives good service at reasonable rates.



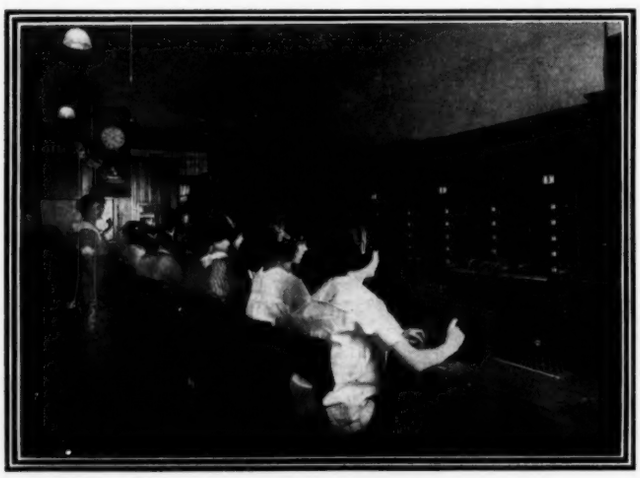
C. L. Tuttle.

Since the company began operations it has made an average gain of 154 telephones per year and at the present time it has over 2,350 subscribers. A comparison shows that the telephone growth exceeds the population growth. The company serves a territory of 144 square miles with exchanges at Ontario and Upland, Cal.

For long distance it has connections with the Pacific Telephone & Telegraph Co., the Mountain States Telephone & Telegraph Co. and the United States Long Distance Telephone & Telegraph Co.

The company's tangible property is now worth approximately $250,000, averaging an increase of $20,000 per year in changes and permanent construction for the past three years.

Much of the success of the business and efficiency of the service is due to the energy and ability of the manager, Charles L. Tuttle, and R. B. Campbell, president.



Operating Room of Ontario & Upland Telephone Co.

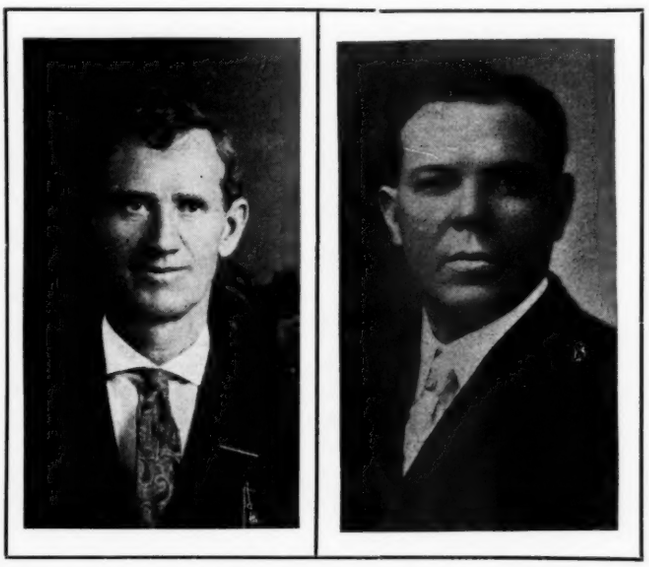
WHITTIER AND DOWNEY HOME COMPANIES.

Two other thriving Independent companies in southern California are the Whittier Home Telephone & Telegraph Co. and the Downey Home Telephone & Telegraph Co., operating respectively in Whittier and Downey. These companies are under the able management of Aubrey Wardman, who has been secretary and manager of both companies since their inception.

Mr. Wardman is an experienced telephone man, having been engaged in telephone work for some 20 years. From 1896 to 1899 he was associated in various capacities with the Detroit Home Telephone Co., the Citizens company of Grand Rapids and the Michigan State Telephone Co. He was later connected with the Cuyahoga Telephone Co., of Cleveland, and several street railway and electric light companies. In 1902 he went with the Home Telephone & Telegraph Co., of Los Angeles. In 1903 Mr. Wardman became interested in the Whittier and Downey companies. TELEPHONY's readers will remember the article relative to these companies which appeared in TELEPHONY, of July 3.

The Whittier company was organized in 1903 by P. T. Spencer with 125 telephones in operation and has since experienced a steady and rapid growth until it now serves 1,825 subscribers. Upon the death of Mr. Spencer in 1906, Mr. Wardman purchased his holdings in the Whittier and Downey companies, which consists of two-thirds of the stock of both companies. S. M. Smith, an extensive walnut grower is now president of the Whitney company.

The Downey Home company was organized in 1904, a year after the Whittier company, serving some 75 subscribers. At the present time over 550 subscribers are served in the original district and an exchange has been established at Artesia serving about 125 subscribers.



S. M. Smith. A. Wardman.

Report of New England Telephone & Telegraph Co.

The gross earnings of the New England Telephone & Telegraph Co., of Boston, Mass., for the year ending June 30, 1915, were $17,973,606, an increase of $175,279 over the previous year. The operating expenses were $12,925,476, leaving net earnings of $5,048,129, an increase of $667,779 over 1914. The surplus for the year was $295,678, an increase of $176,241 over the previous year.

Earnings of Pacific T. & T. in Oregon.

According to a report recently filed with the Oregon Public Service Commission, the operating revenues of the Pacific Telephone & Telegraph Co. in the state of Oregon, for the year ending June 30, 1915, were $2,115,669, an increase of $24,400 over 1914. Although Oregon's business shows a gain in the year, the total net revenues from operation in all states where the company does business is $123,557 less.

Fall Weather

Glamour of History—The Problem of Estates

By J. C. Kelsey

As I write, I am riding on a favorite railway. It is a Southern road, smooth of track and extremely interesting as it winds in and out of the Tennessee hills. It abounds in tunnels which suddenly turn day to night and gives one the partial sensation of a gas-ridden trench.

In the fall of the year, the beauties of its scenery are unsurpassed. It is hard to believe, as you look out your window, that "Boys of the Sixties" died along every cross tie of this extremely stategic pathway.

At that time the Northern troops held Chattanooga. Immediately to the south, the Confederates, supported by this railway, strongly opposed their advance. It became necessary to cut the line of this railway, destroy bridges and dynamite tunnels so that advances could be made without further great sacrifices of life as had already been made. In many ways, the conditions along the French-German line show many counterparts.

Who has not thrilled with the heroism of Captain Andrews and his 21 brave Ohio boys? Captain Andrews and his men set out on this dangerous mission along the railway. Disguised as Confederates, they made their way 100 miles through the enemy's lines. Discovery meant death for the men were in the habiliments of spies.

It was at Big Shanty, Ga., that the opportunity seemed to arrive. Conductor Fuller and crew left a train standing on the main track and went to dinner. The Ohio boys swarmed onto the engine and took possession, but they forgot one detail. In their excitement and haste they did not cut the bell rope. When the engine was quietly started, a telltale bell warned the train crew that something was wrong.

It is an old story now. Captain Andrews cut wires, passed other trains, pulled up rails and did his best to escape. So close was the pursuit that there was no time to set fire to bridges, tear up enough track or dynamite tunnels.

Finally the constantly increasing forces of Conductor Fuller caught up with the fugitives. Eight were hanged as spies, six escaped and eight were exchanged from Libby Prison.

The plan of cutting the railway failed and gives us all a lesson that the big things of life are only attained by hard work and sacrifice rather than strategy.

War is a peculiar institution. The psychology of war is as mysterious as that of golf, baseball and all other competitive efforts of man. At the battle of Tannenburg only this last year, the Russians were absolutely unanimous in the belief of victory as the days went by. Yet they slowly crawled into a trap laid by the German commander.

Sometimes the real victor retreats, and the defeated army holds the battlefield. At Chickamauga, it remained for historians to decide the victor—something like prize fights in New York, the victor being decided by the newspapers.

It applies to industry and should teach men that apparent success is not always a safe standard to set up.

History draws a certain amount of romance and glamour over the feats of men. Mexican histories tell of the great North American invasion and detail its horrors. Our histories only tell of the continued fight of Santa Anna and do not reveal the theft of even a Mexican chicken.

Northern history tells us of a great battle in the clouds. But as time goes by, we learn that there was a small battle at the foot of the mountain. Southern history tells us that the battle of Lookout Mountain was nothing but a skirmish.

Out of it all we can point with pride to this great fact that our immediate ancestors could fight. It is heart and not great artillery which has always won the wars of the world.

About the only change in war seems to be the question of distance between main armies. Caesar would encamp his Romans within fifty yards of his enemies—at that time the range of neutrality was governed by the distance a man could throw a spear. As soon as the parley between the leaders ended, the soldiers would mix it up until the psychology of war decided a victory.

Then came arrows and other projectile tossers and men were farther apart as they drew up in battle lines. Finally, the muzzle-loading rifle and cannon came into use, and men not only camped farther apart but went under cover. The three-mile neutrality limit was finally decided upon, for men never dreamed that a solid shot could be thrown farther.

In spite of the new conditions of war, the tactics of Grant are still the tactics of Joffre, Kitchener and Von Hindenburg. They send a few men forward, only to fall back for reinforcements, until the main bodies finally unite for grips.

It goes to show that there is really nothing new in the world. We may do all we please to make progress and change the map of Nature. But in the end, we will find natural causes at work, working for just the same ends as they did when our immediate ancestors worried about them.

The train has just stopped. Just out of the window stands a sign: "The battle of Stone River began at a point 2½ miles west of this depot on December 31, 1862, and continued until January 2, 1863."

Do you know that this battle was one of the bloodiest of the war? Pull down your dusty history and read of the heroic efforts of your fathers! Read of the incident when fifteen hundred men lost their lives in a few moments.

Read what they did in bloody angles, bloody ponds, wasps' nests and hornets' nests. Then when someone intimates that you live in a China, look him in the face and remember the real fighting blood in your veins. Don't believe for a minute that this nation has lost its love of, and ability to, fight.

As I ride along, I am wondering what the history of the telephone business will be. As in war, so will history have to determine the victories of peace. You will remember that the telephone business was born of war.

It came at a time when the world was just beginning a real industrial era. It came at a moment when men began a movement to conquer the world in an industrial sense. It came at a time when men could take advantage of conditions and suffer no check or control on the part of the people.

It came at a time, you might say, before the dawn of the present big business era. That was a most sensitive time—a time when explosives were most likely to explode.

Through the courts, a small group of men had control of a weapon which was to be a mighty factor in the coming battle of industry. Groups of men were absolutely sure of establishing new schools of economics.

They had plans of monopoly, efficiency and subjection not unlike what its enemies call the German kultur. In other words, men were about to create an industrial Tower of Babel.

There were two groups of telephone contenders—one, the Boston or monopoly group, and the other the Independent group.

Men went into the telephone business with a rush and with few thoughts. They rushed into it in a blaze of excitement—into a business which never slumbers or sleeps.

The typical telephone man did not have much money, but there were many men with money who felt a grievance at the monopoly group so intent upon the re-arrangement of natural laws. The man who had money naturally had retired, or was about to retire, from business; in other words, he was getting old. And he owned the majority of the stock of the company.

Now comes a history of many of the sales of successful Independent telephone properties to the Bell company. It is a condition and not a theory which even confronts the telephone business today. It goes clear beyond Kingsbury letters and attorney generals. It goes clear beyond government, for it reaches into the tomb.

The elderly man who had money and came whole-heartedly to the assistance of the telephone man as long as he lived, must die, or perhaps is dead. His affairs naturally go into the hands of executors to settle up the estate.

At the present moment, I have in mind a fine Wisconsin property. It was a par property, worth dollar for dollar of any man's money. It was practically owned outright by a very wealthy man, because he, alone, seemed able and willing to furnish the money for the inevitable growth.

Most wealthy men, active in business, are great borrowers, and being great borrowers, they are hard up for cash. The families of these men, realizing the wealth of the father, find it hard to reconcile the scarcity of money to the story of great property wealth.

When the wealthy man dies, there is at once a very vigorous rush for the property. The poor children are usually hungry and thirsty. They have been something like the Ancient Mariner who said: "Water, water everywhere with not a drop to drink." They have seen property everywhere with not a dollar to spend, and they want money.

Naturally, when the old man has turned his weary face to the wall, the sons and sons-in-law cannot restrain their impatience. In this particular case, the telephone property was quickly sold at a price which did not bring 50 cents on the dollar. What did it matter to the new owners? They wanted money and money they must have.

This is our problem. It is the problem of our estates. The biggest properties we have, and the smallest as well, have the same danger.

How many telephone men know whether the death of the principal owner of the property will not set them adrift to seek new employment, after giving their best years to its service? How many telephone men, today, who insist upon the curtailment of other men's activities, know whether the morrow will throw his own property into the same situation?

When a group of executors, who have no sympathy or acqaintance with the property, take charge of it, what hope have you of keeping affairs going in their old straight line?

I know of more than one telephone property in which the family discontent is above par over the money that has been invested in the property. I know of a woman who personally charges the telephone company of robbing her of a car, some new furniture and decent clothes, as she calls them.

How long would such a family or that woman hesitate to show their life-long resentment against that property when the question of sale took place? All the king's horses and all the king's men could not restore that property again to its psychological position before the master died.

I have heard men say that there never was a time when there were so many telephone mergers in prospect. It seems to me that there are less today than at any time in ten years.

The purchases of Independent properties in 1906 and 1907 were relentless and without interference. The prompting cause of the matter was mostly because of the estate problem.

The prompting cause of the sale of the North Dakota Independent Telephone Co. to the Bell company was that two of the principal owners were in poor health, and feared to let the property go to their estate at their death.

Nine times out of ten the problem of the estate is the condition which besets us. What are we going to do about it? What can our associations do? What can anyone do except to buy the property?

So far, financing companies have not been welcomed. We refuse to patronize such an organization. We can protest and accuse, yet we know that the executors are after the money. The executors do not know and do not care anything about associations, traditions or memories.

The answer to the situation is plain. Make the properties pay or put them in such shape that you, or any stockholder or backer you may have, may turn his face to the wall with a satisfaction of leaving something worth while.

Every business has its hardships, evils, barnacles and parasites. The worst evil of the Independent telephone business is that necessity which compels men to leave the property in estate.

No one lives forever. Death puts a property in new and strange hands. It reminds one of conditions where a new Pharaoh came into the land which knew not Joseph.

Heirs like successful properties and are not fond of properties which absorb money rather than expend it. It is a lesson to put the telephone house in order to pay dividends and make stockholders proud to know you. It teaches telephone men to act promptly, today, to make territorial and other adjustments and correct evils while our friends are still alive.

We cannot forget the utter impersonality of money. The love of money and property is an element of our civilization. Convertibility of property into money has never lost its attractiveness.

Men offer their homes for sale merely to see if they can sell. Men seek new jobs merely to see if they can get a new job. Telephone men like to feel that long and faithful service is convertible, too. They can only do that by being able to show the heirs a fine and desirable property.

Some day our history will be written. As was the case with Captain Andrews, we will not live to see it written. But it will be written just the same, and it is safe to say that not one word will be devoted to the small differences of opinion we are indulging in today.

Instead of hunting for panaceas, let us cultivate the ground we are walking on. Then our executors will read our history with unmixed pleasure.

MORAL: We may look better in history.

Washington, Ind., Exchange to Have New Quarters.

The Central Union Telephone Co. is preparing to move into its new quarters on the second floor of the J. A. Gill Building, at Washington, Ind. All of the old equipment now in use will be discarded and new apparatus installed, including a new switchboard that will care for the city's needs for ten or fifteen years to come. George W. Dyke is local manager of the company.

Automatic Switchboard Telephone System of Los Angeles

History and Description of Present Automatic System—Operation of Traffic Distributor Switchboard—Flexibility of Automatic Switching—Paper Presented at Panama-Pacific Convention of American Institute of Electrical Engineers—Final Installment

By W. Lee Campbell

While the arrangement illustrated in Fig. 7 and already described for handling calls from the automatic offices to the manual gave good service, it was slower and more expensive than full automatic service, and therefore, after about two years of operation, by which time the number of automatic lines had increased greatly, it was decided to install equipment which would enable the automatic subscribers to complete connections automatically to all manual subscribers' stations excepting those connected to private branch exchanges.

This was accomplished by ending the trunks incoming from the various automatic offices, in second selector switches installed at Main office. The bank levels 1 to 9 of these second selectors were used to call third selectors, which in turn extended connections to connectors. The banks of these connector switches were multipled to all the manual lines in Main office, excepting the trunks to private branch exchanges. All Main office numbers from 1,000 to 9,999 were made into the five digit numbers required for automatic working by prefixing the letter A before them. On the calling devices the letter A was printed beside the figure 1 so that it took the place of the old word Main in the operating instructions.

When this apparatus had been installed at Main office, manual subscribers secured all of their connections as before, but an automatic subscriber who wanted any Main office individual line, simply spelled out on his calling device the desired party's

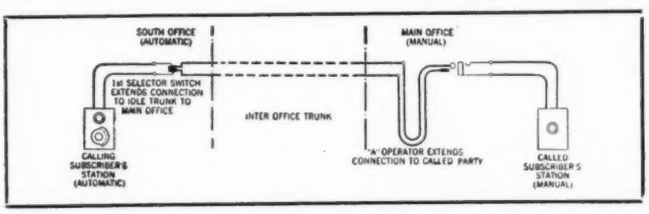

SOUTH OFFICE (AUTOMATIC)
MAIN OFFICE (MANUAL)
1st SELECTOR SWITCH EXTENDS CONNECTION TO IDLE TRUNK TO MAIN OFFICE
INTER OFFICE TRUNK
CALLING SUBSCRIBER'S STATION (AUTOMATIC)
"A" OPERATOR EXTENDS CONNECTION TO CALLED PARTY
CALLED SUBSCRIBER'S STATION (MANUAL)

Fig. 7. Diagram of Connections from South Office to Main.

number, and secured connection, without an operator's aid, just as if the desired party had an automatic telephone. An inter-working busy test such as that already mentioned as being used between the "B" board and the automatic switchboard in each of the various automatic offices, was used between the connector switch banks and the multiple of the manual board in Main office.

To secure connection to a private branch exchange trunk, automatic subscribers were instructed to call 10. The figure "1" caused a calling party's first selector to connect his line to an idle trunk to Main office, where a second selector was operated in response to the "O" and extended the connection to an operator, who took the calling party's order and completed the connection, by plugging into the jack of a trunk line to the desired P. B. X.

The next step in the transformation of the system resulted in the elimination of Main office. This was accomplished by establishing a new central office named Olive in a fireproof building erected for the purpose five or six blocks from the old Main office. Sufficient automatic apparatus, using Keith line switches of the early type then available, mounted on round uprights (Fig. 10), was installed in Olive office to accommodate all of the individual subscribers' lines terminating in Main office, and they were gradually switched over to it. A portion of the manual switchboard, thus freed, was moved to Olive office to handle the P. B. X. trunks in so far as calls incoming from them were concerned, while trunking connector switches were installed so that automatic subscribers from that time on made their connections automatically to P. B. X. trunks also.

The company's headquarters were then moved to the Olive office building and the old Main office building was abandoned

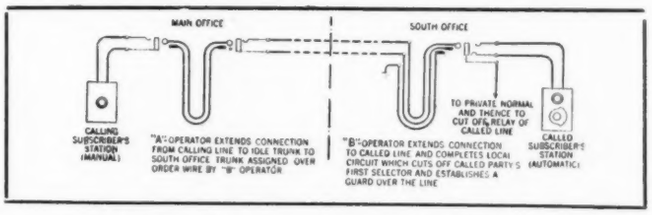

MAIN OFFICE
SOUTH OFFICE
CALLING SUBSCRIBER'S STATION (MANUAL)
"A" OPERATOR EXTENDS CONNECTION FROM CALLING LINE TO IDLE TRUNK TO SOUTH OFFICE TRUNK ASSIGNED OVER ORDER WIRE BY "B" OPERATOR
TO PRIVATE, NORMAL AND THENCE TO CUT OFF, RELAY OF CALLED LINE
"B" OPERATOR EXTENDS CONNECTION TO CALLED LINE AND COMPLETES LOCAL CIRCUIT WHICH CUTS OFF CALLED PARTY'S FIRST SELECTOR AND ESTABLISHES A GUARD OVER THE LINE
CALLED SUBSCRIBER'S STATION (AUTOMATIC)

Fig. 8. Connection from Manual to Automatic Office.

and sold. The system was then full automatic with the exception that a portion of the old manual board, transferred to Olive, as already mentioned, and a portion of the old "B" board at each of several of the larger automatic offices were still operated for handling calls from the numerous manual private branch exchanges, to the automatic subscribers' stations. These connections were set up by the methods illustrated in Figs. 8 and 9, *i. e.*, the full manual method shown in Fig. 8 was used when a call was made during the rush hours for a line connected to an outlying automatic office equipped with a "B" board, while calls during less busy hours or to the smaller automatic offices were made with dials after the manner illustrated in Fig. 9.

In order to permit this method of handling calls outgoing from the P. B. X.'s to be changed to automatic calling it would be necessary to put calling devices on all of the P. B. X. boards and to remodel some or all of their circuits, and the company felt that its organization and resources could be utilized more advantageously in meeting other demands.

Since the system now serves six times as many stations as it did twelve years ago and much of the growth has been paid for out of earnings, it may be imagined easily that all available energy and money have been needed for taking care of enlargements.

The great extent of the area to be covered has presented a continuous difficulty. For example, between South Pasadena and a small manual suburban office at Beverly Hills, two offices within the flat-rate unlimited service area, there are 22 miles

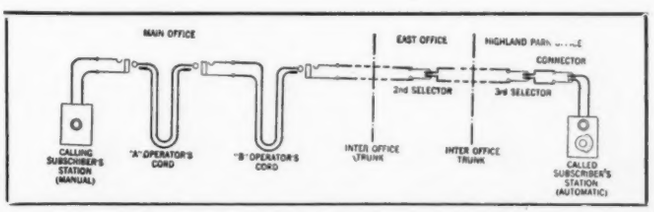


Fig. 9. Outgoing Connection from Main Office to Highland Park.

of cable. To maintain a high standard of transmission, a portion of the South Pasadena trunk cable is made up of conductors of No. 16 B. & S. gauge and is of special design.

The maintenance of a high standard of transmission throughout the city has been made easier by the comparatively large number of offices used. Increasing the number of offices short-

ens the average subscriber's connecting loop. In Fig. 11 are shown the present offices of the Home Telephone & Telegraph Co. and of the Pacific Telephone & Telegraph Co. The latter company serves about the same number of subscribers as the Home company and, of course, uses the Bell type of manual equipment. It has nine offices, where the Home company has 15. The difference between automatic and manual practice is especially striking in the southern portion of the city, where the Home company has six offices and the Bell company three. In outlying centers like Hollywood or Highlands, one office is necessary with either type of equipment.

Good, substantial, central office buildings, especially suited for their purposes, have been erected by the Home company. The Olive central office and headquarters' building is shown in Fig. 12, Adams office buildings in Fig. 13, and the very simple type of construction used for the smaller outlying offices is typified by the Vernon office building. Buildings of this economical character would not be suitable for manual switchboards with the requisite provisions for the convenience and comfort of the operators.

The character of the outside plant construction is first class throughout the city. Cable is used as much as practicable, and all work is done in a large way with the future in mind.

A skeleton map of the plant as it stands at present is given in Fig. 14. The system includes all of the original automatic

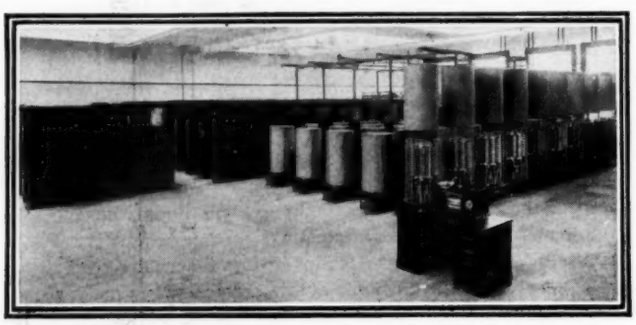


Fig. 10. Automatic Equipment in New Olive Office.

offices and a number of new ones, and serves over 60,000 subscribers' stations.

The number of P. B. X. switchboards is 601, averaging 27 stations each and 3½ trunk lines to Olive office.

The approximate number of automatic lines and stations connected to each office is shown in Fig. 14 and the numbering scheme is as follows:

Olive Office	A-1,000 to A-5,999 F-1,000 to F-7,999	West Office	51,000 to 55,000 556,000 to 557,999
P. B. X. lines	10,000 to 10,999 and 60,000 to 60,999	Wilshire Office	56,100 to 56,799 568,000 to 568,999 569,000 to 569,999 560,000 to 560,999
South Office	21,000 to 25,999 27,000 to 27,999	Hollywood Office	57,000 to 57,800 579,000 to 579,999
Vermont Office	26,000 to 26,899 260,000 to 269,999	Prospect Office	59,000 to 59,899 599,000 to 599,999
Vernon Office	28,000 to 29,999	Adams Office	71,000 to 75,999
East Office	31,000 to 31,999	Normandie	77,000 to 77,999
So. Pasadena	35,000 to 35,999	Arlington Office	79,000 to 79,999
Highland Office	38,000 to 39,999		
Boyle Office	41,000 to 41,999		

It will be noted that in several of the smaller offices six digit numbers are now used, and it follows that some fourth selector switches have been installed in those offices.

The dial number disk used at present is the same as that in the Main office, except that the words Main and Long Distance do not appear upon it. To save trunks, a three-figure number is now used to call long distance, as mentioned further on.

All of the original automatic equipment and that installed at various times since the first installation, is still in use, although, as already mentioned, the circuits have been changed to common battery designs and, recently, changes to automatic ringing are in progress. Many of the first selectors originally used for line as well as trunking switches have been re-arranged for use as trunking switches only, and the lines, which formerly terminated in them, now end in Keith line switches which have been installed more recently. A type of Keith

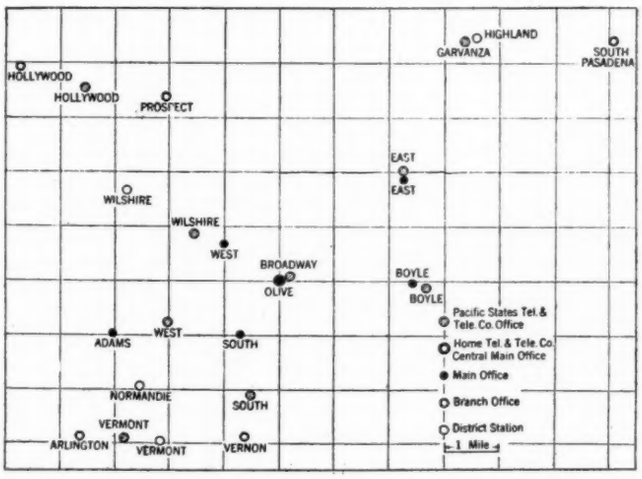


Fig. 11. Present Offices of the Home and Pacific Companies.

line switch upright similar to that used for many of these changes and extensions is shown in Fig. 15. The use of these uprights in place of the old Strowger switch uprights, shown in Fig. 6, reduces the floor space required per thousand lines of switchboard about 40 per cent.

The unit or "sectional-book-case" designs used in the construction of automatic switchboards have been of great help in avoiding the sacrifice of any equipment in the many readjustments and enlargements of plant, which have been made necessary by the rapid growth of the city.

The numbers of trunk lines used between the various offices are given in Fig. 16, which contains many interesting features to which lack of space forbids extended reference.

The traffic is quite heavy, averaging per week-day 14 to 18 originating calls per automatic station connected to the Olive office, 7 to 9 calls per week-day from each station connected to other automatic offices and 5 to 6 calls from each of the

Fig. 12. Exchange Building and Headquarters of Olive Office.

16,000 stations connected to manual private branch exchanges.

The average number of originating calls handled per day by each P. B. X. trunk is about 37, which is 50 per cent. higher than the average experienced in full manual plants. It is thought that the increased efficiency is partially due to the

automatic setting up and disconnecting of calls incoming to the P. B. X.'s, which shorten the time each such call occupies a trunk.

The total traffic per week-day sums up to from 500,000 to 600,000 calls, of which about 80,000 are from P. B. X. stations.

Fig. 13. The Adams Exchange.

A step in the direction of changing the P. B. X. trunk lines to full automatic sending was taken in 1914, by removing the last of the "B" boards from the automatic offices and installing traffic distributor apparatus, consisting of Keith primary and secondary line switches in Olive office, between the main distributing frame and the "A" board used for handling calls received via P. B. X. trunks. In other words, the answering jacks have been removed from this board, and each trunk now terminates in a primary line switch to the banks of which trunks to secondary line switches are multipled. The banks of the secondary line switches are multipled to trunks ending in cords and plugs in the "A" board.

Therefore, when an operator at a P. B. X. inserts one of her calling plugs into a trunk-jack, a primary and a secondary line switch at Olive office instantly switch that trunk into connection with an idle cord circuit before an idle "A" operator. If the call is for an Olive office subscriber or for another P. B. X., this "A" operator completes the connection by plugging into the multiple in the usual way. If it is for a subscriber in any of the other offices, however, she plugs into an automatic trunk and dials the desired number by using a calling device which is now a part of each operator's equipment.

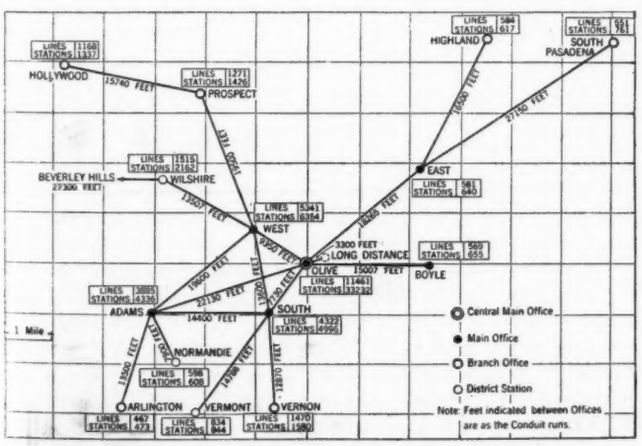


Fig. 14. Skeleton Map of Present Los Angeles System.

These automatic trunks end in first selectors in the Olive office so that the former plan of having the operators omit the first digit of the called number and manually select a trunk direct to the desired main exchange has been eliminated. Each operator has a set of non-multipled trunks to the first selectors and those switches automatically pick out idle inter-office trunks for her.

The present method has increased the efficiency of the trunks and the accuracy of the dialing, while, at the same time, it has simplified the work of the operators, because they no longer have to mentally divide a number into two sections nor do they have to make a busy test on a trunk before using it.

On account of certain engineering problems, calls to the outlying offices are at the present time sent over special sets of trunks as indicated in Fig. 16; but it is planned to make changes, which will enable all such calls to be sent over the regular automatic trunks, and thus to considerably increase the inter-office trunk efficiency.

The line switches in which the incoming trunks from the P. B. Xs. terminate are arranged in groups of 25 each and each such group has ten outgoing trunks to secondary line switches.

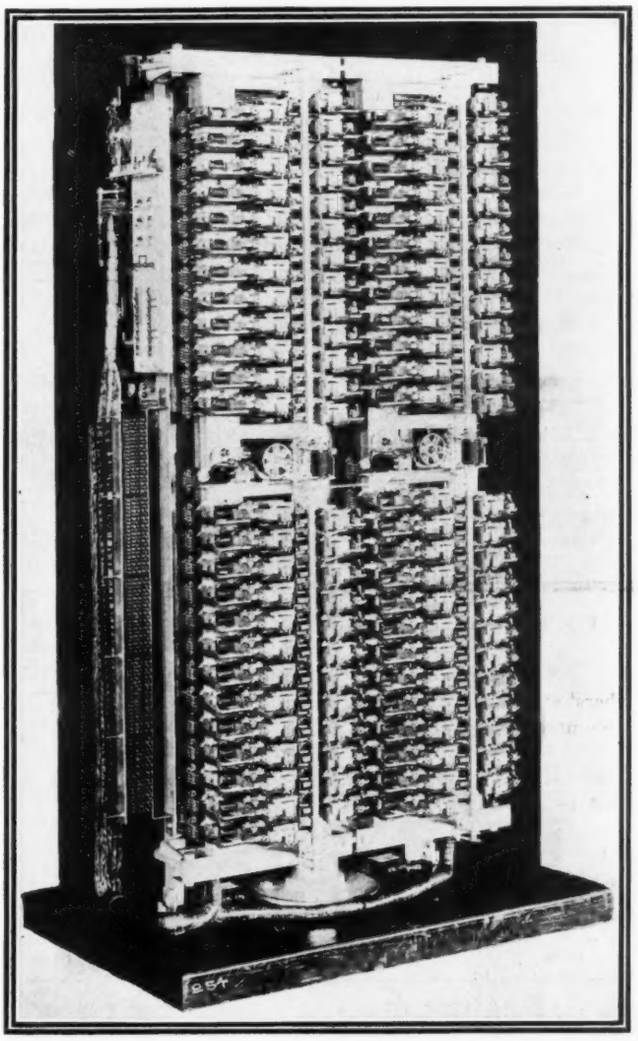


Fig. 15. Keith Line Switch Upright.

The secondary line switches are arranged in groups of 20, and each group has ten trunks leading to plug ending cord-circuits on the operators' positions.

The line switches are of the latest two-wire type, with self-restoring plungers, and are wired especially for traffic distributor work. The pairs of relays for the line switches are mounted under individual covers on a rack placed above the line switch shelves.

Thirty operators' positions are equipped with 20 cord circuits each and are more than sufficient to take care of the peak load from the 600 P. B. Xs. and 100 intercommunicating systems.

The scheme of wiring each of the 10 trunks outgoing from any primary line switch group to a different secondary group, and of wiring each of the trunks outgoing from a secondary

line switch group to a different operator's position, is such that a call coming from any P. B. X. trunk is switched to any one of the operators on duty who may be idle at the instant.

The cord circuits are arranged for automatic ringing both on manual and automatic calls and double supervision is supplied. The cord circuits are so designed also that if a calling P. B.X. operator has had a connection established, and wishes to make another call or again secure an "A" operator for any reason, she can disconnect instantly by releasing the line switches and immediately come in on another cord circuit. This is possible only after a connection has been established, for each call is locked until the "A" operator receiving it either completes the connection wanted or releases the call by means of a key.

There cannot be more than one uncompleted consecutive call in front of any operator; that is, when any position has received a call it is immediately busied to all other calls, until the operator throws the associated key into the ringing position.

On account of the extremely heavy traffic experienced on the P. B. X. trunks, special provision had to be made for taking care of simultaneous originating calls. It was at first found that occasionally during rush periods two or three calls would appear simultaneously in front of an operator, and it was, therefore, arranged so that the operator would answer only one of them and the others would be switched automatically to idle positions. To ensure instantaneous operators' responses, the line signal lamp on each position is connected to apparatus which transmits a mild buzz to the operators' head-receiver. This buzz is cut off as soon as she throws an answering key.

Provision is made for taking care of extreme peak periods by an arrangement of the primary master switches, which is such that when all the outgoing trunks from any group are busy either because of calls or lack of operators, the master switch will not continue to search for an idle trunk, but the call will be stored in the equipment until a trunk is available. Any operator's position is automatically made busy when she removes her talking-set plug from its jack.

The chief operator's desk is provided with supervisory signals, which tell her at all times how many master switches or groups of trunks are loaded to the limit. A supervisory lamp is provided for every master switch, and by observing these lamps, the chief operator can always tell whether she has enough girls at the switchboard to take care of the load.

The traffic distributor has reduced the number of operators required at the peak load in Olive office from 41 to 30, and has eliminated five "B" operators' positions formerly used in the South, West and Adams offices. The engineer of the company estimates that the 30 operators' positions he has equipped will continue to be sufficient even when the business has grown considerably more.

The curves in Fig. 17 show graphically what results have been obtained by the installation of this semi-automatic apparatus. Curve *A* gives the number of un-equated calls handled by each "A" operator during a peg count taken in September, 1914, a month or two before the new equipment was put into service. Curve *C* shows the average number of calls dialed by "B" operators from the three dialing positions at Olive office to the smaller outlying offices, at the time of the peg count mentioned above.

Curve *B* shows the results in June, 1915, with the traffic distributor in operation and the "A" operators dialing the calls (about 30 per cent. of the total) to outlying offices. It is interesting to note that, in spite of the work of dialing, the average operator completes over 50 per cent. more connections than she formerly did at the hour of peak load. Both before and after semi-automatic operation individual operators have been required frequently to exceed the average peak load. This excess sometimes ran as high as 50 per cent. with the former arrangement, but now rarely exceeds 25 per cent. Neither September nor June are months of as heavy traffic as the winter months, but they represent average conditions fairly well.

The Home company's engineer had all the cord-circuit relays assembled and wired in sets with one base for each cord circuit, so that each cord-circuit equipment looks like an automatic switchboard repeater, is provided with a jack and is mounted on a regular repeater shelf. The cabling is so arranged that when the company is ready to change the method of handling the P. B. X. trunks from semi to full automatic, it will simply mean removing the present cord-circuits from their jacks and replacing them with repeaters designed to transmit impulses direct to first selector switches.

Trunks from \ Trunks to	A. Olive	P. Olive	West	South	Adams	Wilshire	Vernon	Prospect	Hollywood	Vermont	Boyle	East	Highland	Normandie	So. Pasa	Arlington	Semi-Auto.	Long Distance	Total
Olive			100	80	59						20	32						20	311
West	120	80		60	40	106		67	53		9	14							537
South	116	74	70		60		77			58	8	10							473
Adams	60	49	50	46							5	8		52		25			295
Wilshire			142																142
Vernon	35	25	20	36	10					6	5	6							143
Prospect	20	20	19	11	8	8			11		2	3							102
Hollywood	16	17	40	7	7	6		10			2	5							110
Vermont				80															80
Boyle	18	9	7	8	5							5							52
East	18	10	7	9	6						5		35		30				120
Highland	20	10	7	9	4						3	5							58
Normandie					59														59
So. Pasa	10	10	7	6	5						3	5	7						53
Arlington	8	7	6	7	9						3	3							43
Semi-Auto			100	90	50						7	20						9	254
Long Distance	16	10	15	10	9						5	5					37		107
Total	457	321	590	459	331	120	77	77	64	64	77	121	42	52	30	25	37	29	2939

Fig. 16. Table Showing Trunk Lines Used Between Various Exchanges of the Home Telephone & Telegraph Co., Los Angeles, Cal.

All calls from any automatic telephones to the P. B. Xs. are handled automatically through rotary connectors, just as before the traffic distributor was installed. As already explained, all the P. B. X. trunks are multipled to the banks of these connectors, so that it is impossible for connectors to stop on trunks which are in use either by a P. B. X. for outgoing calls therefrom or by a traffic distributor operator on calls to P. B. Xs.

These connector switches are of special design, for the circuit of each is such that if an automatic subscriber calls a P. B.X. and, when through talking, hangs up his receiver before the attendant at the P. B. X. removes her answering plug from the trunk jack, his connection will not all be released, but, contrary to the usual practice, the connector switch will remain connected to the trunk until the attendant at the P. B. X. removes the plug from the trunk jack. If it were not for this provision, the line switch associated with the trunk would operate, because of the plug being in the jack at the P. B. X. after the connector switch released, just as if the P. B. X. operator were initiating a call. The result would be that a traffic distributor operator would receive a false signal.

To take care of the extremely heavy traffic, 44 connectors are provided for completing calls to each group of 100 P. B. X. trunks.

The Home company receives thousands of inquiries daily for the time-of-day. The call-number for such service is F-91. This call switches each inquirer to an idle trunk which leads to the Home company's own P. B. X. board, at which all such inquiries are answered by the operator on duty.

Since these particular trunks are used for no other purpose, the operator answers a signal on any of them by throwing a key and stating the hour and minute, without asking the caller what he wants. If several calls come in within a short period of time, thus occupying several trunks at once, she can speak to all of the inquirers at once.

The P. B. X. operator had some spare time, so that she very readily handles this service at no inconvenience or additional cost to the company.

A party wanting connection to an information operator calls the number F-93, and by means of first, second and third selector switches is trunked to the information board which is located in Olive office.

All of the four to six thousand information calls made daily are handled on an eight-position switchboard and one call distributor position. The incoming information trunks terminate on the distributor position. There is an operator on this position during the busy hours of the day, and her work is to manually route the incoming information calls to idle information clerks.

There are before her eight small groups of jacks connected to trunks to the eight different clerks' positions, and, as the incoming information trunks end in plugs and cords, it is a comparatively easy matter for the distributing operator to plug the calls through as they come in, so that no clerk will have more than one unanswered call in front of her. This ensures practically instantaneous responses. At peak periods, when more than eight information calls may come in at once, the distributor operator herself answers the overflow calls by saying "Information, just a moment, please."

A calling subscriber when so answered, and even if he should have to wait 10 or 15 seconds for his information, is more satisfied than if he had to wait some time without being told he had reached the desired department.

The distributor operator acts also as supervisor over the other information girls. Disconnection supervision is given on the distributor position and on the individual positions. During times of light load all the information trunks are plugged through to a few of the information positions, and the distributor operator and any clerks, who are not required, are dispensed with.

The information desk is four-sided with two clerks' positions on each side and the distributor operator is at a separate desk. Every clerk's position is provided with an inter-leaved directory for use in supplying alphabetical information. In the center of this desk is a rotating-turret card-file which affords full numerical and geographical information for the whole plant and to which all clerks' positions have ready access.

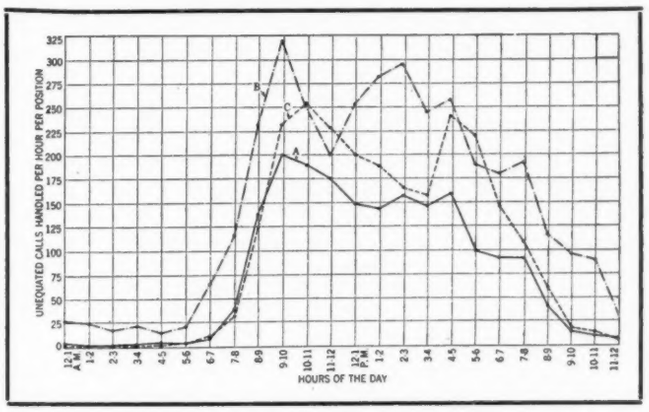


Fig. 17. Results Obtained by Installation of Traffic Distributor.

Changed number service is taken care of at the present time at five different district centers. At each of these centers there is a special test desk used for various purposes, and on this the changed-number trunks are terminated in different groups of jacks corresponding to the various classes of service, such as "take-outs," "moves," "special refers," etc.

Recently the Home company has tried the experiment of connecting the switchboard terminals of "take-outs," *i. e.*, subscribers whose telephones have been taken out, to a pair of bus bars supplied with current which will produce a peculiar tone in the receiver of any party who may attempt to call such a line and who consequently will be automatically switched into connection with these bus bars.

It has been found that subscribers very quickly learn the meaning of such a tone, and in addition to the saving of attendant's hire, there is an advantage to the subscriber in that he will hear this tone in less time than if he had to wait for a clerk to respond.

At one time, all the "dead-level" calls, *i, e.*, calls for numbers which have never been used, were answered by attendants, but it was found later to be much more satisfactory to supply this special tone on such connections, and that a subscriber calling an unused number either accidently or otherwise, would almost immediately, upon hearing the tone, hang up and call again. This latter scheme was adopted only after an extended series of tests had been made to determine the reasons for subscribers making dead-level calls. This showed that in very nearly all of such cases, the subscriber had transposed his figures or in some other way confused the called number, and that when informed by the attendant that he had made a mistake, he rarely repeated his error.

On each changed-number position there appears also a multiple of all the outgoing trunks from the office, and the attendant makes periodical tests on every inter-office trunk for impulse and conversation transmission efficiency. In several offices the same girls do general record work also, and answer the calls incoming to the office from company employes.

This changed-number service is handled at five centers instead of one, because it is possible to connect to one trunk only a limited number of the lines, the calls for which require such service; and on account of the transient nature of a considerable portion of the population of Los Angeles, especially during the tourist season, it would be necessary to use an excessive number of valuable inter-office cable pairs for the changed-number service if it were concentrated at one point.

The complaint service call number is "O." Complaints also

are received at five district centers. A special feature in Los Angeles is the method for handling the so-called "double-number" complaints. Such complaints are peculiar to automatic plants, and in most cases are such calls as would be satisfied in a manual plant by the operator saying, "They don't answer" or "I am ringing them"; or cases where a supervisor would be summoned to verify busy reports, etc.

Complaint Service.

In Los Angeles, when a subscriber reports that he cannot get a wanted number, the complaint clerk immediately calls the number desired on an outgoing trunk of her own. If she secures a response from the called party, she then directly switches the complaining party into connection with the called party via the trunk used by her. It has been found that in about 66 per cent. of the cases, the complaint clerk is able to get the wanted party.

The complaint clerk is enabled also to cut in on any busy line to determine if it is "busy" because it is actually in use or because the wanted party has left his receiver off its switch-hook. She has means also for testing on any "no-response" call to determine if the bell of the called station is actually being rung or not.

At one time it was the general practice to have an experienced automatic switchboard attendant or tester respond to each of these complaints by asking the calling subscriber to dial the desired number under the supervision of the tester. This was for the purpose of detecting any possible disorder which might have caused the complaint, but inasmuch as the records showed that two-thirds of all such re-calls secured a response from the wanted party, and nearly all of the remainder failed because of legitimate conditions, such as absent subscribers, delayed responses or actually busy lines, it was concluded that this was a very inefficient method for the company, and resulted in much loss of time by calling parties. The present method was therefore adopted.

It was at first suggested that the subscribers might be inclined to abuse the new method of handling such complaints; that is, that some might be inclined to call a complaint clerk and have her dail all of their numbers for them, but during 18 months of close observation with the new method in use the "double-number" complaints have not exceeded the original number of 1 per 300 calls, or 1 per station per month. It is, of course, only logical that the fear of abuses should have been ungrounded, because telephone users almost invariably prefer to make their own connections.

All of the outside plant testing and all dispatching of repairmen is done at five district centers. At one time, each of the 15 individual offices handled all such work for its own district, but by combining the small districts into larger ones, it was found that the repairman could be worked at much higher efficiency and that troubles were removed more quickly.

Test-connector switches are installed in all the offices, so that by using his dial the wire-chief or line-tester, at each district center, can make immediate connection to any office and to any line therein that he may have occasion to test.

This centralization of outside plant testing is of comparatively recent development and is thought to be especially practicable in automatic systems. It has been planned to combine some day the present five groups into two or possibly one. That has already been done in the routing and dispatching of service-tap crews, all such work being very satisfactorily handled from one desk in the Olive office.

Handling of Long Distance Calls.

The long distance lines, to which the Home Telephone & Telegraph Co. connects, are owned and operated by the United States Long Distance Telephone & Telegraph Co. and serve the commercial district about Los Angeles. They connect in the south with the automatic system at San Diego, run north 200 miles to Santa Maria and east to San Bernardino and Redlands.

Los Angeles subscribers now secure long distance by calling a three-figure number, F-95. The first figure of this number gives a calling party an idle trunk to Olive office where the second digit actuates a second selector which picks out an idle trunk to a third selector. This third selector responds to the figure 5 by extending the connection to an idle cord circuit on the position of a recording operator, who takes the patron's order in the way that is common practice everywhere and tells him that he will be called when the wanted party has been secured.

The only other feature peculiar to automatic practice in handling such a connection is the work done by the line operator in calling the automatic subscriber when the party wanted by him is on the line. All calls from line operators for subscribers in the Olive office are completed by a switching or special "B" operator in Olive office, who has access to the full multiple of all lines which is used by the operators who handle the P. B. X. trunks. Calls for all other offices are completed by the long distance operators themselves by means of dials. Each line operator has access to a certain number of outgoing trunks to first selector switches which are situated in the long distance office, and from the banks of these first selectors, trunks are run to the various main offices throughout the city, where they terminate in second selectors.

Not only do the Los Angeles automatic switches establish about half a million local connections daily, but practically all long distance calls originating within 50 miles of the city and completed through the Home company's plant are set up by these same switches in response to calling devices which are installed upon the various long distance boards in the surrounding territory, and manipulated by the operators presiding over them. In fact, one exchange 100 miles from Los Angeles dials its calls to subscribers in that city.

This method of setting up and taking down long distance connections speeds up the service very decidedly and thereby increases both the patrons' satisfaction and the efficiency and earning power of the long distance lines. One does not realize how very important speed is in a territory served like this by competing long distance lines, until he learns that it is fairly common practice for a busy patron to order up a desired connection over both lines, to talk over the one which is ready first and to cancel the order given to the slower competitor.

The various kinds of service previously mentioned and others, such as fire calls, police calls, etc., to which reference might have been made, show how flexible automatic switching equipment is and how well adapted to fulfill the requirements of modern telephone service; otherwise it would not have been possible to gradually build up, in the face of the keenest competition, the great successful system serving the people of Los Angeles.

Proper Standards Insure Good Service.

When one not thoroughly initiated into the mysteries of automatic telephony is informed that for an average automatic connection in a system like that in Los Angeles, the selector and connector switches perform 50 separate and distinct operations, making a total of over 21,000,000 per day for the system, and that if the mechanisms fail in one of these operations, if some patron fails to secure the party he calls, the novice wonders that any individual or organization ever had the temerity to attempt to supply telephone service automatically. In fact, he is inclined to accept without question the statement, of an old, dyed-in-the-wool manual telephone engineer, who upon first hearing of an automatic switchboard, exclaimed, "God never intended that telephone service should be given in that way."

But as one becomes somewhat better acquainted with the apparatus he begins to understand that the selector and connector switches are all alike in most of their mechanical features and are each constructed and adjusted to operate be-

yond certain limits of line resistance, capacity, inductance and leakage, which are entirely feasible and practicable. These limits are no narrower in the automatic system than they are in manual systems, and, in truth, the mechanisms readily operate beyond the limits which are necessary to keep the transmission of conversation up to a reasonably good standard. Therefore, although every connector switch in the Los Angeles system must be ready to respond at any time to impulses sent from the calling device of any one of the 45,000 automatic telephones, scattered all over an area of about 200 square miles, no serious difficulty and no element of chance is encountered. Nor is it necessary or possible to adjust each switch to the various lines. On the contrary, the switches are not adjusted to the lines at all, but to certain standard, artificial lines whose characteristics are more severe than those of any of the real lines in the entire system.

Thus by the use of a few easily attained standards, an operating problem, which appears at first glance to be very complex and mysterious, becomes so simple that when attacked by the efficient, well supervised organization of the Home Telephone & Telegraph Co. the result is unexcelled telephone service—a result much appreciated in the commercial and social life of the city of Los Angeles.

I wish hereby to express publicly my indebtedness to Leo Keller, chief engineer of the Home company, for his valuable assistance in supplying data for this paper.

Proceedings Before Commissions, Courts and Councils

Discussions and Rulings of State Bodies Having Supervision of Telephone Companies, Decisions of Courts in Matters Affecting Public Relations of Utilities and Actions of City Councils Bearing Upon Franchises, Rates and Service

Patrons Should Bear Part of Expense of Consolidation.

In an investigation by the Wisconsin Railroad Commission to determine proper rates to be charged by the Washington County Telephone Co., of Schleisingerville, Wis., it appeared that the company's investment was somewhat larger than is the usual investment for companies operating somewhat similar systems. It developed that the company had purchased the property of a competing concern which was operating in practically the same territory and paralleling its lines in many cases. The amount paid for the property was, apparently, considerably more than the reasonable value of the property. Moreover a large part of the property was scrapped in eliminating duplications which existed under competitive conditions. The commission says:

"Whether the applicant credited its property and plant account with the cost of portions of its property which were scrapped, the evidence does not show, but the rather high book value of the property would seem to indicate that the property and plant account had not been credited with the cost new of property removed from service."

Consideration is given the fact that better service was secured by the consolidation of the properties.

"That the long distance connection thus obtained, and the elimination of duplication were of sufficient value to the general body of subscribers to justify the company in charging rates at the present time sufficient to meet the fixed charges on its entire investment, a very large part of which is not represented by tangible property at the present time, is not clear from the records before us.

"It is true that under the present laws physical connection may be secured between telephone systems wherever reasonably necessary, but such connection, even at the best, is not likely to be equivalent to service of equal extent furnished by a single company. The company has undertaken to furnish this more valuable service, and although a part of the fixed expenses resulting from the consolidation should probably not be thrown back upon subscribers, but should be considered as a loss to the company, resulting from its having operated in a competitive field, it seems to us to be reasonable to expect that subscribers should bear a portion of the fixed expenses which were incurred, in eliminating a condition unfavorable to good telephone service."

Rate Increase Authorized at Bangor, Wis.

On application of the Bangor Telephone Co. of Bangor, Wis., the Wisconsin Railroad Commission, on September 25, authorized a change in the schedule of rates so as to increase the revenues of the company, which complained that the existing rates were inadequate. The order provides, however, that the number of subscribers on some of the party lines must be reduced. The following new schedule of monthly charges is authorized:

Single line business telephones	$1.50
Two-party business telephones	1.25
Single line residence telephones in village	1.25
Two-party residence telephones in village	1.10
Four-party residence telephones in village	1.00
Metallic rural telephones	1.25
Rural telephone service	1.15

York State to Consolidate with New York Telephone Co.

The American Telephone & Telegraph Co. has notified the Department of Justice, at Washington, D. C., of a proposed consolidation of the York State Telephone Co. with the New York Telephone Co. The York State Telephone Co. operates in Elmira, Binghamton, and vicinity, in New York State.

In its statement to the Department of Justice the American Telephone & Telegraph Co. recites that the New York company had acquired, prior to December 19, 1913, the date of the Bell agreement with the government, 95 per cent. of the bonds and 95.7 per cent. of the stock of the York State Telephone Co.; that none of the lines of the York State company extend out of the state of New York; that the consolidation has been approved by resolutions adopted by the Elmira and Binghamton chambers of commerce; and that no objections to the consolidation have been made by the New York Public Service Commission.

New Schedule of Rates for Charlotte, S. C.

A new system of rates for the Southern Bell Telephone & Telegraph Co., in Charlotte, N. C., was ordered at a recent meeting of the Charlotte executive board. The action of the civic body was taken after the submission of statistics by City Electrician R. P. Connelly, showing the comparative rates now in force in many cities of the country, similar in size to Charlotte.

The new schedule of rates is as follows: Private line, $2.50 per month; duplex, $2; business, $4; business extension, $1, and residence extension, 50 cents per month. According to the order of the board, the new rates will become effective on November 1.

Making Extensions to Serve Patron of Another Company.

The Chippewa County Telephone Co., of Chippewa, Wis., was recently denied authority by the Wisconsin Railroad Commission to extend its lines to serve a subscriber in the town of LaFayette. The subscriber is at present served by

the Wisconsin Telephone Co., which company filed an objection to the construction of the line in question. The subscriber is a tenant on a farm and desired the change in service so as to be able to communicate directly with his landlord. The commission finds that his service and the landlord's service are otherwise adequate.

Owing to changes that may take place in the ownership of the farm, the commission states, its tenancy, or the conditions of the lease, the continuance of any advantage of the service of the Chippewa company over the present service through any length of time seems problematical.

Securing Service From Rural Company at Fixed Rental.

A short time ago a complaint was filed with the Wisconsin Railroad Commission by a Mr. Carroll, to compel the Superior Rural Telephone Co. to give him service on payment of a fixed rental fee in place of the terms under which all other members secure their service, involving a large expenditure at the outset and a nominal payment monthly thereafter. The other members asserted that the company cannot continue business on the plan proposed by Carroll. When Carroll applied for service recently, he was assured by the company that he could have it on the same terms as all the other members, but he demurred at the expense of connecting and purchasing an instrument, declaring that he proposed to have the service at a rental charge just as he would be able to do in the city. The commission made an order to that end without going into the merits of the matter, according to company officials, and the company has now petitioned for a hearing of its side of the case.

Injunction Restraining Collection of Penalty.

The Union Telephone Co., Owosso, Mich., has applied to the circuit court for the dissolution of an injunction restraining the company from collecting a penalty of 50 cents imposed on Attorney Fred J. Northway, of Durand, for non-payment of telephone rental in advance, as the company's rules require.

The company contends that the village of Durand had no authority to fix rates that were the basis for the petition for an injunction, this power being especially delegated to the state railroad commission. The suit is similar to one begun by the city of Owosso to restrain the telephone company from collecting a penalty of 50 cents a quarter where the rent was not paid in advance. The circuit court held with the city, but the supreme court dissolved the injunction obtained by Owosso.

Foosland (Ill.) Telephone Co. Granted Rate Increase.

In a ruling handed down by the Illinois Public Utilities Commission on September 22, the Foosland Telephone Co., of Foosland, Ill., is given permission to place in effect a new and higher schedule of rates. The new rates are based upon the investment and earnings of the plant, a reasonable profit being allowed.

The new rates, compared with the old schedule, are as follows:

	Old Rate.	New Rate.
Business telephones	$15 per year	$24 per year
Residence, single line	14 per year	18 per year
Residence, party line	12 per year	15 per year
Rural	15 per year	18 per year
Switching	4 per year	4 per year

Big Allowance for Depreciation in Milwaukee.

Max Schoetz, assistant city attorney of Milwaukee, declares that the allowance of 8 per cent. for depreciation made to the Wisconsin Telephone Co. by the state railroad commission is the highest allowance of its kind on record in the United States, so far as he can learn.

Mr. Schoetz has communications from railroad commissioners in all parts of the country. These letters show that depreciation allowance in the New England states, California and Illinois is 5½ per cent. He had one letter showing in Vermont an allowance of only 4 per cent.

Mr. Schoetz declared that the 8 per cent. allowance given the Wisconsin Telephone Co. has permitted it during the last five years to lay aside over $1,300,000 from its depreciation fund.

Company Accepts Order Requiring Refunding of Deposits.

The Pacific Telephone & Telegraph Co. has agreed to refund all $5 deposits heretofore required from subscribers in the state of Washington, in compliance with the ruling of the Washington Public Service Commission, handed down August 21. The company accepts the order of the commission, which forbids the collecting of deposits, and requires the refunding of all deposits now held.

Governor Signs Bill for Commission Regulation of Rates.

The bill introduced by Representative Cooper conferring authority upon the Alabama Railroad Commission to regulate rates of all telephone and telegraph companies, which was recently passed by both houses of the legislature, has been signed by Governor Henderson.

Pole in School Yard.

A telegraph and telephone company, which set its pole in a schoolhouse yard where it remained with the city's assent, did not owe a ten-year-old school boy any duty to guard against the contingency that the boy would climb from adjacent premises upon the rods on the pole, which were too high for him to reach, and be injured by sliding down the guy wire and catching on the untwisted end of the wire. In such case, the conduct of the boy constituted contributory negligence.

McMinn vs. New England Telephone & Telegraph Co., Supreme Judical Court of Maine; 95 Atlantic, 210.

Injury to Telephone Lineman.

A splicer in the employ of a telephone company, who knew that a defect he was about to repair was a blow-out attended with possibility of great danger, and who violated the master's known rule requiring him to wear rubber gloves, where it did not appear that he could not have done his work while wearing such gloves, was guilty of a disobedience of the master's rule, defeating any right of recovery for his death from a shock.

Larkin vs. New York Telephone Co., Supreme Court of New York; 154 New York Supplement, 804.

Forfeiture of Franchise.

Where a telephone company's franchise authorized it to operate an automatic telephone system and a telegraph system, and to conduct a general telephone and telegraph business, the abandonment of the use of automatic telephones and the installment of manual telephones did not constitute nonuse of the franchise, so as to authorize forfeiture.

City of Tacoma vs. Sunset Telephone & Telegraph Co., Supreme Court of Washington; 150 Pacific, 427.

Contributory Negligence.

Where, in an action for the death of plaintiff's husband, a lineman of a telephone company, from coming in contact with an uninsulated wire of the defendant electric company while he was ascending a telephone pole, there was evidence of negligence by defendant in not having the wire properly insulated or constructed, the questions of negligence and contributory negligence were for the jury.

Phillips vs. Erie County Electric Co., Supreme Court of Pennsylvania; 94 Atlantic, 1070.

Maintenance of Telephone Wires.

A telephone company's line was adjacent to a signal line belonging to a municipality. A wire on the municipal line broke, and its officers drew the loose end of the broken wire down from the top of the pole to a point on the telephone company's pole, which stood five or six feet away, wrapping it loosely, so that it rested upon the foot spikes. The wire became disengaged from the spikes and fell to the sidewalk. Plaintiff, who was walking on the sidewalk, tripped on the wire and was injured.

It was held that, while the telephone company was bound to keep its own wires in a safe condition, yet it was not liable where it did not know of the acts of the municipality, it not being bound to anticipate danger from such a source.

Mickle vs. Southern Bell Telephone & Telegraph Co., Supreme Court of Alabama; 69 Southern, 105.

Damages for Mental Suffering.

In action for failure of a telephone company to transmit a call attempting to notify plaintiff of the expected death of his half-sister, the fact that the sender told the operator that plaintiff's half-sister was dangerously sick and expected to die, and that it was a "rush call," was sufficient to notify defendant of probable mental suffering from the failure to transmit it. Even if he only stated that it was a "sick message" it was notice of such probable mental suffering.

Southwestern Telegraph & Telephone Co. vs. Andrews, Court of Civil Appeals of Texas; 178 Southwestern, 574.

Summary of State Commission Hearings and Rulings.

ARIZONA.

September 22: The Arizona Corporation Commission has indefinitely postponed the hearing to be held for the purpose of investigating the rates of the Pacific Telephone & Telegraph Co., in Flagstaff, until an examination can be made of the company's accounts.

ILLINOIS.

September 22: Foosland Telephone Co., of Foosland, Ill., authorized to put into effect a new and higher schedule of rates.

September 22: St. Clair Farmers' Mutual Telephone Co., of Millstadt, Ill., authorized to establish higher rates for certain classes of service in order to end discrimination. It will charge $2 a month for business telephones, $1.25 for residence telephones and 25 cents for switching.

September 22: The commission denied the petition of the reorganization committee of the Western Illinois Telephone Co., of Macomb, Ill., and the Independent Switchboard Co., of Elvaston, for approval of a contract to operate their lines in connection with each other. The Mississippi Valley Telephone Co., of Carthage, filed objections, claiming that the terms of the contract were discriminatory because messages between Elvaston and points reached by the Western Illinois Telephone Co. were free, whereas toll charges were made between points at shorter distance over the same line. The commission sustained this contention.

September 22: Joint pole agreement between the Central Union Telephone Co. and the Central Illinois Independent Telephone Co. at Rutland, approved.

September 22: Certificate of convenience and necessity granted to the Daniels Telephone Co., of Iuka, to construct and operate a telephone line from Xenia to Louisville.

September 22: Joint contract between receivers of the Central Union Telephone Co. and the Mt. Pulaski Telephone & Electric Co. to operate their lines at Mt. Pulaski in connection with each other, approved.

September 22: Orion Telephone Exchange given permission to charge $5 a year for switching rural lines, instead of $3.50.

September 22: Joint pole agreement between receivers of the Central Union Telephone Co. and Fairbury (Ill.) Telephone Co., approved.

September 28: Hearing at Chicago on application of the Polo Mutual Telephone Co. to increase rates between Polo and various towns in the vicinity.

September 28: Hearing in Chicago on petition of the DeKalb County Telephone Co., of Sycamore, for authority to increase telephone rates at DeKalb, Sycamore and Malta.

September 28: Hearing in Chicago in the case of the National Brick Co., of Chicago, against the Chicago Telephone Co., in regard to charge for service at branch office of complainant in Chicago.

September 28: Application of Geneseo Telephone Co. for authority to change telephone rates at Geneseo, heard in Chicago.

KANSAS.

September 21: Haverhill Co-operative Telephone Association authorized to issue $4,320 worth of common stock. Sixty of the 114 shares to be issued are to go to the stockholders of the Rosehill-Augusta Mutual Telephone Co., recently consolidated with the Haverhill. The other fifty-four shares are to be sold at par, $30 a share. The Haverhill association is capitalized at $21,000.

September 22: Application filed by the Holton Telephone Co., of Holton, Kan., for permission to abrogate certain discriminatory contracts with subscribers and to establish a new and uniform schedule of rates. The company also asks permission to discontinue the present free service between Holton, Mayetta, Whiting, Larkin, Denison and Netawaka.

MARYLAND.

October 8: The commission will resume its hearings relative to the investigation of the Chesapeake & Potomac Telephone Co. The time for filing briefs in this case was set for October 1. Three briefs were to be filed, one by the counsel for the telephone company, one by Osborne I. Yellott, people's counsel, and the third by Marbury & French, counsel for the Protective Telephone Association, which made the complaint upon which the investigation is based.

MICHIGAN.

October 1: Postponed hearing on application of the Michigan State Telephone Co. for permission to install a modified system of metered service in Detroit.

MINNESOTA.

September 23: The commission denied the application of the O. K. Telephone Co., of Martin county, for physical connection with the Grygla Co-operative Telephone Co., of Grygla, Minn. The O. K. company recited that it has a line to the farm of Arne Buck and from there wanted to use the lines of the Grygla company. The commission ruled that a circuit should be built from the farm of Arne Buck to Grygla.

October 1: An extension of time to this date has been granted the Tri-State Telephone & Telegraph Co. and the Northwestern Telephone Exchange Co. by the state railroad and warehouse commission in which to answer the petition of the city council of Owatonna, Minn., for a physical connection between the lines of the two companies. The council wants the toll lines of the Tri-State company connected with the local exchange of the Northwestern company as people desiring to use the Tri-State toll lines now are compelled to go to pay stations to put through their calls.

MISSOURI.

September: The commission has granted permission to E. H. Huffman to sell and R. M. Snow to purchase the plant and property of the Atlanta Telephone Co., Atlanta, Mo., the consideration for the property being $10,850. Case No. 784.

September: Application has been filed with the Missouri Public Service Commission, asking permission for T. F. Waters to sell and G. Adrian to buy the telephone plant now owned by T. F. Waters, at Waters' Switch, Mo., for a consideration of $50.

September 23: Hearing of arguments by the attorneys of the Southwestern Telegraph & Telephone Co. for re-hearing in the St. Louis rate case.

NEBRASKA.

September: Chadron Telephone Co., Chadron, Neb., authorized to establish a rate of $1.50 for farm line telephones.

OREGON.

September 18: Hearing on application of the Creswell Telephone Co., of Creswell, Ore., for permission to increase its rates and make changes in its service.

November 1: Hearing on application of the Coos & Curry Telephone Co. and the Coquille Valley Telephone Co. for permission to increase their rates at Coquille, Ore.

PENNSYLVANIA.

September 23: Hearing on the petition for the ratification of an agreement under which the Keystone Telephone Co., of Philadelphia, shall lease all surplus space in its underground conduits to the Philadelphia Electric Co.

WEST VIRGINIA.

September 18: Order authorizing the Wadestown Telephone Co., of Wadestown, W. Va., to increase its rates.

WISCONSIN.

September 25: Bangor Telephone Co., of Bangor, is authorized to increase its rates, the company having complained to the commission that the existing rates were inadequate.

September 25: Cuba City Telephone Co., of Cuba City, Wis., authorized to increase its yearly telephone rates to business subscribers from $6 to $8. Heretofore the regular rate has been $6 a year for all classes of service.

"Telephony's" Home Study Course for Telephone Men

A Complete Presentation of the Principles Underlying Modern Telephony in All Its Branches—Arranged Systematically So That Regular Reading and Faithful Study Will Qualify Ambitious Men for Higher Positions—Prepared Under Supervision of Stanley R. Edwards—This Section Written by Jay G. Mitchell

Quiz Questions on the Preceding Installment.

The answer to these questions will be found in the reading section bearing the same number. Answers are not to be sent to TELEPHONY for criticism. For the benefit of those desiring the advantages of a correspondence course, the Engineering Extension Department of the Iowa State College has volunteered to answer questions and criticize replies to questions and solutions of the problems which will be presented from time to time in connection with the course. No charge will be made for this service and the offer applies to all subscribers of TELEPHONY regardless of whether they live in Iowa or elsewhere. Correspondence should be addressed to the Engineering Extension Department, Iowa State College, Ames, Iowa.

190. Do all common battery telephone circuits require the addition of a condenser to render them operative?

191. What are the advantages of the so-called direct current telephone circuit? Why is a two-conductor cord, other things being equal, to be preferred to one having a greater number of conductors?

CHAPTER X. Alternating Currents.

192. *Non-inductive resistance.*—Every telephone man knows that it is not at all difficult to talk over any circuit having a resistance of 1,000 ohms. It is practically impossible however, to talk through a ringer having 1,000-ohm coils. The telephone talking circuit is practically a non-inductive resistance, while the ringer circuit is highly inductive.

Any resistance including a coil of wire, with or without an iron core, constitutes an inductive resistance. In other words, it is subject to the effect of self induction when a current is sent into it. If the coil of wire encloses an iron core, its permeability is tremendously increased and its self induction is much higher. Since the telephone ringers are always bridged across the common battery circuit, there would be a very serious loss of talking current were it not prevented by the impedance of their windings.

The impedance of any coil is made up of two components. One is due to the plain resistance of the winding in ohms, and the other is due to the turns in the coil, the frequency of the current and the nature of the magnetic circuit.

In the discussion of alternating current matters, it is necessary to make a distinction between the voltage *impressed* upon the circuit and the voltage that is really effective for doing work in the circuit. This is not necessary in considering direct currents because the impressed voltage and the effective voltage are then one and the same.

Let us suppose that an alternating current at 110 volts is sent into a circuit containing an inductive resistance, such as a telephone ringer wound to 1,000 ohms resistance. If the current were direct current, it would be a very simple matter to determine its strength by means of Ohm's law. We find, however, that when the current is alternating in character, the current does not have the strength that Ohm's law would lead us to expect. Apparently a part of the voltage has been required to overcome the additional opposition due to the effect

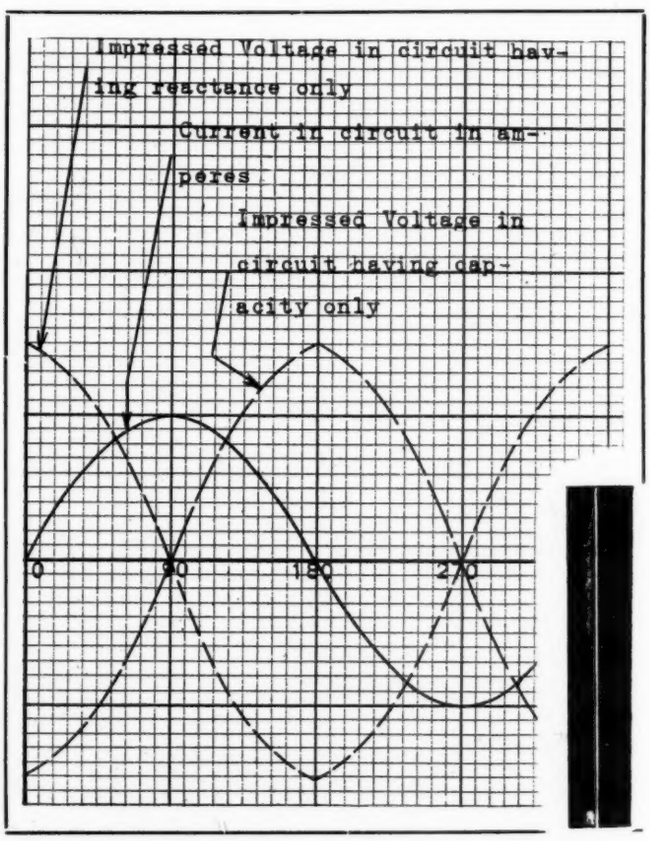


Fig. 81. Opposing Effects of Reactance and Capacity.

of the inductive resistance in circuit. This leaves something less than the entire voltage to create a current flow.

It has been shown how the self induction of any coil is due to the change in the current strength flowing in its coils. We have seen that the windings of a coil produce an opposing electromotive force whenever the strength of the current flowing is varied in any way and when a new current is created. In Fig. 81 this condition is shown graphically. The solid heavy line represents the alternating current in amperes flowing in the circuit.

When this current is changing at the most *rapid rate*, the opposing voltage represented by one of the dotted line curves,

is at its maximum. When the current is not changing, the opposing voltage is at its minimum value. We know this is true because the voltage produced by any loop of wire in a magnetic field is proportional to the number of magnetic lines of force cut by the loop per second. Therefore when the number of lines of force withdrawn from the winding of the ringer, or inserted into it, is the greatest, the resulting opposing voltage of self induction in the winding is also at its greatest value. But the loop is not enclosing any additional lines or surrounding any less lines than formerly when the current is stationary in value.

If the circuit includes only the ringer coil or other impedance, the current in the circuit will not reach its maximum value at the same instant as the impressed voltage. This will be more clearly understood after the discussion of the effect of self induction or inductance and capacity in the alternating current circuit.

193. *Effect of self induction.*—We have seen how, in the graphic method, the rise and fall of an alternating voltage may be represented by a curve. The horizontal dimension or length of the alternating curve is measured in degrees. These correspond to the angular position of an imaginary coil of wire as it makes one complete revolution for each cycle in the magnetic field of a two-pole generator. It is clear that *any* alternating voltage may be represented in the same way, although as a matter of actual fact, it may be produced in the secondary winding of an induction coil instead of the armature coil of a generator. In other words, the *length* of a complete alternating voltage, or current wave, is 360 *degrees.* A wave that is one-half completed, has passed through 180 degrees and one that is one-fourth completed, has passed through 90 degrees.

If one alternating current wave should start and pass through one-fourth of its cycle, or 90 degrees, and then another one should start having the same polarity, it would be said that the second alternating wave were lagging 90 degrees behind the first. If there were two waves which started at the same time and reached their maximum at the same time, passed through the zero value at the same time and ended at the same time, there would be no lag or lead between them and it would be said that they were in phase.

In any alternating current circuit having resistance *only*—that is without either self induction or capacity—the current wave and the voltage wave are in phase. Such a circuit is not possible of realization since either capacity or self induction, or both, are always more or less present. Since the self induction in an alternating circuit has the effect of opposing the current when it is increasing, and sustaining it when it is decreasing, the fluctuations of the current flowing in the circuit will not coincide with the fluctuations of the voltage impressed upon it.

We have seen (section 192) that the effect of the self induction in an alternating current circuit is the greatest when the current is changing the *most rapidly* in value. But the current is changing the most rapidly in value when it is near its zero value, and it is changing the least rapidly when it is at its maximum value. When the wave of current has passed through 90 degrees of its cycle and is at its maximum, the *rate of change,* and therefore the effect of the self induction in the circuit, is just appearing and is at its minimum. Hence it is correct to say that the effect of self induction in the circuit differs 90 degrees in phase from the current in the circuit.

It should be noted that the effect of self induction in any alternating current circuit is always in opposition to the fluctuations of the current. The result of the insertion of self induction is therefore to cause the current to follow its normal rise and fall in strength *after* the impressed voltage. In other words, self induction always causes the current to *lag behind* the voltage. In a theoretical circuit, possessing only self induction but not resistance or capacity, the current would lag the full 90 degrees behind the voltage.

194. *Effect of capacity.*—Since the effect of capacity opposes the fluctuations of the alternating current the *least* when the current is *changing* in strength the most rapidly (when it is passing through its zero value) and the most when it is not changing in value at all, it is very clear that the effect of capacity is exactly the reverse of the effect of self induction. In a theoretical circuit having capacity only, the opposing effect due to the capacity is at its minimum when the current is at its maximum.

It is at its maximum when the current is at its minimum or when it is changing the most rapidly. In other words, the effect of capacity in an alternating current is always to *assist* the normal fluctuations in the current strength. With capacity only in the imaginary circuit, the impressed voltage is at its maximum 90 degrees later than the current and it may then be said that the current *leads* the voltage by 90 degrees.

Since the effect of capacity is to cause the current to lead the voltage and the effect of self induction is to cause the current to lag behind the voltage, it would seem that some combination would be possible for a given circuit in which the one be employed to counteract the other. Professor Pupin's loading coils are a successful attempt to design a reactance coil that will neutralize the effect of the capacity in telephone circuits for the average frequency and line conditions.

The exactly opposite effects of capacity and self induction in an alternating current circuit are shown very clearly in Fig. 81. The heavy curve represents the current in an alternating current circuit and the lighter the impressed voltage when the circuit contains capacity only, and when it contains self induction only, respectively.

(To be Continued.)

To Stop Public Use of Flat Rate Telephones.

The New York Telephone Co. has adopted strong measures to stop the public use of flat rate telephone service. The subscribers of the Utica exchange have been served with a notice calling attention to the regulation of the company, contained in the contract under which the company is furnishing service, restricting the use of telephone service furnished on a flat rate basis, to the subscriber, his agents and representatives, and to the subscriber's continued violation of that regulation.

The subscriber is notified in accordance with the provisons of his contract that the same will be and is hereby terminated, and that unless satisfactory assurances are received that the regulation set forth above will no longer be violated and a new contract is entered into by the subscriber on or before termination date, his telephone service will be discontinued. The drug stores are the ones principally affected by this action.

Practical Subjects—Letters and Discussions

Badge of Honor for Operators of Central Home.

In the way of a badge of honor the Central Home Telephone & Telegraph Co., of Louisville, Ky., is sending out to the thirty odd exchanges of its system an attractive enameled pin which is reproduced in the accompanying illustration, for distribution among the 200 or so operators. These pins are in recognition of the good work which they have done in the past year or more in speeding up the service, and are to serve as a reminder that similar performances are counted on from these same girls in the future.

As may be seen in the illustration, the slogan, "Service First," is prominently displayed. This slogan has been the keynote of the operating division of the Central Home system for over a year. The pin is in the form of a small brooch, the exact size of the accompanying reproduction, gold plated, of a quality which will wear well. The lettering is all in gold. Around the outer edge of the pin on a blue enameled ground are the words, "Central Home Telephone & Telegraph Co." Directly across the face of the pin in a red enameled band on which appears the slogan in larger letters, "Service First.", The center is a white ground in which is displayed the Independent shield with alternating gold-outlined stripes of red and white. Altogether it is very attractive and is being received and worn by the girls with pleasure.

The plan of the company is to supply only the operators with these pins, at least at the outset, although there is a possibility that the same design will be used in making emblems for the men in the form of lapel buttons, for watch fobs, cuff buttons, scarf pins, etc. Though the pins which are now being distributed are of gold plate, the company has in mind a plan of having others made up of better quality for presentation to the girl who earns some special attention by some meritorious work.

"Service First" was selected as the slogan of the operating division of the system a long time age, even before the managers of the exchanges undertook to form and live up to the tenets of the "I Told You So" Club. Last spring B. Y. Chambers, assistant superintendent of the Central Home company, addressed a letter to the managers, in which he emphasized the significance of the slogan. It embraced, he pointed out, everything that the system is striving for—courtesy, accuracy, speed, co-operation, good judgment and all other good things. In the letter to the exchanges which accompanies the pins Mr. Chambers summed up the significance in the following:

"They (the operators) must realize that they control the throttle and steering wheel of our company and can make good or bad the future record of our company. They must therefore be attentive and progressive and select the best course. I realize that there are numerous irregularities which occur daily in telephone operating to impede their progress and offset their efforts, but I hope such irregularities will only be stepping stones to a higher standard of service. With this in view and a true spirit of loyalty, we give them this pin."

Exchange managers are distributing the "Service First" pins which have been provided, with more or less accompanying ceremony. An instance is that reported by J. J. Veatch, district manager, stationed at Paris. He made the presentation at a meeting of the exchange employes at which were present representatives of nearly all the exchanges in his district. This was a general meeting as well as a meeting called for presentation of the emblems which came as quite a surprise to the employes.

The dictionary had the center of the floor at this meeting and was used to get the right definition of a number of words which are being used in the efficiency campaign of the company. "Loyalty" was one word and it was considered until the real meaning was driven home to every person present. "Work" was another word which it was reported meant a surprising lot to many of those who heard the definition read and discussed. "Co-operation" also got a definition from the dictionary as well as another from one of the "efficiency" letters of W. M. Brown, general auditor, which referred to the calf cartoon printed in TELEPHONY of August 21.

In his speech on presenting the pins to the women employes of the Paris exchange (those of the other exchanges in the district will be supplied by their local managers) Mr. Veatch said, in part:

"In presenting you with this pin, we beg to mention that the object in view is not of an advertising nature, but is in recognition and appreciation of the good work you have done; and in receiving this emblem we sincerely hope you will be inspired to continue the most noble work in building up our service and making a reputation of good service for the individual exchanges so that the Central Home will stand out and above all others in this line.

The prominent feature of this pin is the slogan, 'Service First,' and, if, in accepting the pin, you resolve to be attentive, co-operative, loyal and not afraid of work, then service will be first."

At Paris and at other exchanges of the company the pins have been received most appreciatively by the girls and several of the managers have written in to the Louisville office that the men employes are beginning to murmur that they are entitled to something of the same character. At Paris the improvements at the exchange plant are nearing completion and will include a commodious rest room for the operators. When this is completed a district operators' meeting will be held.

Automobile Tour of Telephone Men Through the South.

Recently some men well known in the telephone field enjoyed an automobile trip through Pennsylvania, Maryland,

Telephone Men on Umbrella Rock, Chattanooga, Tenn.

West Virginia, Virginia, Tennessee, Georgia, Kentucky, Indiana and Ohio.

Those in the party were J. W. Coffey, of the Coffey System & Audit Co., Indianapolis, Ind.; B. E. Longwell, Geo. Swank, of Johnstown, Pa., E. D. Schade, first vice-president of the

Independent Telephone Association of America; Ed. Greer, of Johnstown, Dan Schaler, secretary of the Doubleday-Hill Electric Co., Pittsburgh, and T. Malbrane, of Johnstown.

They appear in the order named in the accompanying reproduction of a photograph which was taken on Umbrella Rock, Lookout Mountain, Chattanooga, Tenn.

In speaking of the trip J. W. Coffey says:

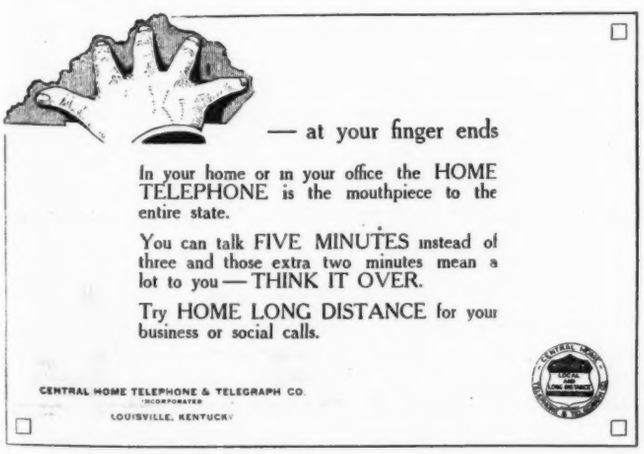
"It was certainly *some* trip. Schade pets his big Cad' 8 just like he does the women and he took us up Lookout Mountain just as easy as he would drive up Michigan avenue. We had two cars all the way until we started to see the city sights, then we would all pile in 'Pop' Schade's Cad' and the party looked and acted more like a bunch of school boys."

Examples of Live Advertising.

The advertisement which is reproduced below is one which was used by the Ohio State Telephone Co. in the Zanesville,

Effective Ad of Ohio State Telephone Co.

Ohio, newspapers, starting September 24. The Ohio State company, as has been previously referred to in TELEPHONY, has been conducting a new subscriber campaign in Zanesville during the past three months. This advertisement occupied a


— at your finger ends
In your home or in your office the HOME TELEPHONE is the mouthpiece to the entire state.
You can talk FIVE MINUTES instead of three and those extra two minutes mean a lot to you — THINK IT OVER.
Try HOME LONG DISTANCE for your business or social calls.
CENTRAL HOME TELEPHONE & TELEGRAPH CO.
INCORPORATED
LOUISVILLE, KENTUCKY

Long Distance Post Card Booster of Central Home Company.

quarter page in the newspapers and was effective in results.

The Central Home Telephone & Telegraph Co., of Louisville, Ky., is also doing some advertising, as the accompanying reproduction of a postal card which the company recently mailed out, shows. The card measures 5 by 7 inches and is printed in blue ink.

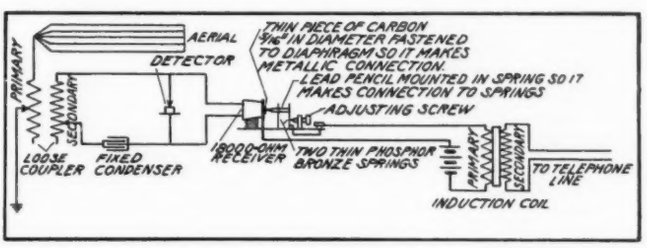
Both of these types of publicity matter are well constructed and indicate that telephone companies are paying more attention to producing effective advertising copy.

The Future Uses of Telephony.

I have been experimenting with wireless telegraphy for about three years. During this time I have tried several experiments on transmitting time signals from Washington, D. C., over telephone lines. This has been most successful, the signals being remarkably clear and distinct.

One method used is very simple. In cold weather, when the signals are very strong, I simply took an 1,800-ohm receiver and fastened it to a sensitive transmitter on an ordinary telephone, which in turn was connected to the telephone line.

The other method was used on signals that were too weak to operate a transmitter, and, therefore, a mechanical means of operating the transmitter had to be used. The accompanying diagram shows the connections of the wireless set and the means used for intensifying the signals. A good 1,800 or 1,500-ohm wireless receiver is mounted on a base, as shown. A piece of carbon about 5/16 in. in diameter is then fastened to the center of the diaphragm on the receiver. The carbon should be very light and



Connections of Wireless Set and Means of Intensifying Signals.

thin. A light phosphor bronze spring is mounted, as shown in the illustration, after which a lead pencil is mounted, as also shown. A brass standard, which is drilled and threaded, is then mounted and an adjusting screw placed in position. A wire is soldered to the spring holding the pencil and taken to the primary of an ordinary induction coil. Then a wire is soldered to the case of the receiver and connected to three cells of batteries in series with the other primary terminals of the induction coil. Then the secondary terminals are connected to the telephone line. After carefully adjusting the adjustment screw the receiver will become a microphone and reproduce the sound over the line.

While there is nothing remarkable about this experiment it does indicate to me that the day will come when we can sit in our homes and converse with a friend across the Atlantic or Pacific Ocean; also with friends who are crossing the continent by railroad, as a few railroads are already equipped with wireless telephone apparatus.

In my opinion, a friend wishing to communicate with a ship station will have his telephone circuit connected to a powerful telephone station located on the shore. The sound will be amplified by means of an audion amplifier radiated by the wireless telephone station at shore and picked up by the ship station. A person on board ship will also be able to telephone home by the same method. Therefore, I believe that in the future wireless telephony and wireless telegraphy will go hand in hand, and by a successful system of wireless telephony the value of the wire telephone will be increased fourfold.

Amboy, Ind. Delbert Myers.

Progress Report of Committee on Inductive Interference

Abstract of the Progress Report of Joint Committee on Inductive Interference of the California Railroad Commission Presented at the Panama-Pacific Convention of the American Institute of Electrical Engineers—The Discussion

At the Panama-Pacific Convention of the American Institute of Electrical Engineers, held in San Francisco, Cal., September 16, 17 and 18, a report of the Joint Committee on Inductive Interference of the California Railroad Commission, was made by A. H. Babcock. In his report, Mr. Babcock outlined the work which has been accomplished by the committee during the past year, its present status, and plans for the future.

Experiments, he said, have been made upon a 37-mile power circuit and private telephone line of the Pacific Light & Power Co., near Los Angeles, together with several banks of transformers and the regular equipment of instrument transformers and portable laboratory. The chief points investigated were the unbalances to ground of a power circuit isolated from ground; the relationship of triple-harmonic residuals to the magnetic density in grounded star-connected transformers; the magnitude of triple-harmonic residuals as affected by transformer connections; and the induction between power and telephone circuits. Tests on unbalances were made without transposition, with two transpositions or one barrel, and with five transpositions or two barrels. At 50 cycles, one barrel was as effective as two. At high frequencies two barrels were more effective and the non-transposed line gave better balance than at low frequency.

Tests of induction at low frequency were made with balanced voltages, balanced currents, residual voltages, and residual currents. Induction at high frequencies was measured with a single-phase source of energy. Computed and measured inductances were found in close agreement. The effect of the ground on one phase of a normally isolated system was studied both experimentally and theoretically. A study was also made of residuals under operating conditions on grounded-neutral networks.

Induction Between the Power and Telephone Circuits.

The results of the committee's investigations of induction between the power and telephone circuits are of particular interest to telephone men. Regarding these investigations, the report says:

The close and uniform association of the two circuits, the two being carried on the same poles, afforded an unusual opportunity for an experimental determination of the co-efficients of induction and a comparison with computed results, and for testing the effectiveness of transpositions in both the power and telephone circuits as means of reducing inductive interference.

Tests of induction at the fundamental operating frequency of the system were made by energizing the power circuit through transformers under conditions favoring in turn the predominant effect of: (a) balanced voltages, (b) balanced currents, (c) residual voltages, and (d) residual currents. The corresponding induction in the telephone circuit was measured simultaneously with the currents and voltages of the power circuit. As the induction from the balanced components of voltage and current is dependent upon the transpositions in the power circuit, these tests were carried out under the three previously mentioned conditions of power circuit as regards transpositions.

The effectiveness of transpositions in the telephone circuit as a means of reducing induction arising from the several components of power circuit voltages and currents, was tested on a short section of the line which contained no power circuit transpositions. In a short section of the "parallel," with both power and telephone circuits non-tranposed, an extensive series of measurements of induction was made using many combinations of conductors and methods of energizing the power conductors. The effects of shielding were studied to a limited extent.

With a single-phase source of energy at high frequencies (Vreeland sine wave oscillator) measurements were made of the co-efficients of induction corresponding to harmonic residuals of high frequencies, and the effect of telephone transpositions, as a means of minimizing induction from such sources, was studied. The lack of a three-phase source of energy at high frequencies prevented the doing of any experimental work to determine the effectiveness of power circuit barrels of different lengths on the induction from the higher harmonics of balanced currents and voltages.

The computed co-efficients of induction were in very close agreement with those experimentally determined. As a basis for the computations of induction from residual current it was necessary to determine experimentally the depth of the equivalent locus of earth currents. In general, the study of induction and of the effectiveness of power and telephone circuit transpositions, while not being as complete as might be desired, owing to the lack of some apparatus and the fact that only one telephone circuit was considered, has given results of considerable value.

The effect of a ground on one phase of a normally isolated system in producing abnormal residual voltages and currents, was studied both experimentally and theoretically with close agreement in the results. Under the abnormal conditions of a ground on a power circuit it is, of course, the resulting residual currents and voltages which cause the greatest damage to parallel communication circuits.

Observations of the residuals of the 15 kilovolt network (Pacific Light & Power Co.) which supplied the committee's temporary substation and field laboratory, were studied under two conditions of operation of the power system.

In addition to the San Fernando work, there has been some work done on a study of the residuals under operating conditions at several points on grounded neutral networks. The object of these tests was to obtain information as to the magnitude of residuals to be expected under different typical conditions of operation so as to afford a basis for future recommendations as to the limitations of residuals of this type of system.

Tests Conducted by A. T. & T. Co.

During the past year a considerable amount of work has been done on several problems by the telephone companies at the request of the joint committee. The American Telephone & Telegraph Co. has conducted extensive tests to determine the detrimental effect, on the intelligibility of conversation, of extraneous currents of different frequencies in a telephone receiver. A report of the results obtained, for single frequencies, has been submitted to the committee and work is now under way with reference to the effect of multiple frequency currents of different combinations. The important bearing of this work was indicated in the discussion submitted by this committee, at the

Deer Park convention of the A. I. E. E., on the subject of irregular wave forms.

Subsequent to the issuance of our report last year, the matter of the redesign of its standard telephone transposition system was undertaken by the American Telephone & Telegraph Co., in order to facilitate compliance with the committee's recommendations in regard to transpositions within the limits of parallels. The present standard system of telephone transpositions affords very limited opportunities for co-ordination with power circuit barrels of different lengths, to make the power and telephone circuits mutually non-inductive. For this reason, the redesign of the telephone transposition system to permit of more flexible arrangements in combination with power circuit barrels was made necessary. This modification of the telephone transposition system applies both to the standard sections and to the short length sections.

At the request of the joint committee, the Pacific Telephone & Telegraph Co. has submitted a report dealing with the development of balance of telephone circuits. This report is the result of an investigation of the methods and measures employed by the telephone companies to obtain good electrical balance of their circuits and to protect them against inductive interference from other telephone circuits (cross talk) and from foreign sources. The report considers the subject from the conditions presented by the earliest experience of the telephone companies to those of the present day. This report was desired as a basis for the consideration of the subject by the committee.

Future Work of the Committee.

The committee has recently been giving careful attention to the matter of future work. There appears to be no good reason for deviation at this time from the general program as laid down in the committee's report published last year. It is expected, therefore, that the future work will continue, as has the work during the past year, along the general lines suggested by that program. The detailed plans for the conduct of this work have, however, been the subject of much discussion.

The facility with which the work at San Fernando could be carried out with both power and telephone lines completely at the disposal of the committee at all times, suggested the possibility of test lines constructed primarily for experimental purposes. Were necessary funds available, tests of great value could, of course, be carried out under such conditions. After carefully weighing all questions involved, it was decided that the information desired could be obtained most advantageously by a study carried out under practical conditions.

The problem offered by any case of parallelism between power and communication circuits is capable of subdivision into two main parts. These are, first, the matters of line configuration and co-ordinated transposition systems to render the power and communication circuits as nearly as practicable mutually non-inductive, and second, the control of residuals and their restriction to frequencies and magnitudes which do not cause material interference either to grounded telegraph circuits or to properly transposed and balanced metallic telephone circuits. Normal operating conditions on the power system are assumed.

With reference to the first subdivision, the problem is identical for both the isolated and the grounded neutral types of power system. The second, control of residuals, differs entirely with respect to the two types of systems.

For the isolated system the principle is relatively simple. Transposition of the circuit involved in the parallel, throughout its entire length, so as to obtain good electrostatic balance offers the most practical way of accomplishing the result desired. Assuming a uniform configuration throughout the line, the transpositions for this purpose must be so located that each conductor of the circuit occupies all of the conductor positions for equal distances. In other words, they must be equally "exposed" to the earth. In addition, the transpositions must be frequent enough so that their balancing effect is not rendered ineffective by the attenuation and phase changes which occur along the circuit at frequencies producing harmful interference to the communication circuits.

With reference to grounded neutral systems, the control of residuals presents a more complex problem, especially on existing systems. Its solution has engaged the attention of the committee in a large measure from the outset of the investigation and will undoubtedly continue to do so in the future, as this seems one of the main outstanding problems. The residuals of grounded neutral systems characteristically contain the third harmonic and its odd multiples, together with some fundamental and other harmonic components due to unbalanced load conditions.

The solution of this problem, therefore, involves a very careful study of transformer connections, magnetic density, the reaction of lines upon the triple harmonics introduced by transformers, and the interaction of the different banks of grounded star-connected transformers throughout a system. The practical solution of a question of this kind requires tests of typical grounded neutral systems under actual operating conditions. Tests such as were conducted at San Fernando, under the relatively simple conditions where the residuals introduced by a single bank of transformers were studied, afford, however, a good foundation for the study of the more complicated cases to be encountered in practice.

To carry out the plans just discussed, a tentative program, now under consideration, includes the investigation of one parallel involving the isolated type of power system and several parallels involving the grounded neutral type of power system. It is felt the study of an isolated power circuit, as conducted at San Fernando, supplemented by one other investigation involving this type of power system, will afford this committee all the information necessary for it to establish, on a firm basis of scientific fact, the requirements for transpositions to give good electrostatic balance on power circuits isolated from ground, and thereby prevent residuals of harmful magnitude. The complex conditions encountered on grounded neutral systems make it inadvisable that general conclusions be drawn from an investigation of a single case.

Effect of Circuit Configuration.

It was said above that theoretical study has been made of the effect of power circuit configuration on the electrostatic balance of the circuit. It is proposed also to study the effect of circuit configuration on the induction between power and communication circuits. Some work along this line has already been done, especially with reference to possible alterations in configuration of telephone phantom circuits.

In general, if it is possible to make power and telephone circuits mutually non-inductive, to a satisfactory degree, by a reasonable number of transpositions installed for this purpose, it is not expected that the question of configuration for either class of circuit will become of controlling importance. Configuration of both classes of circuits will be considerably influenced by other reasons; economical methods of construction for both lines. Other things being equal, it is very desirable that circuit configurations be such that the co-efficients of induction between non-transposed sections of lines shall be as small as possible.

A study of the variation with frequency of the effective-

ness of transpositions in both power and telephone circuits has been suggested. Under practical conditions there are, however, many other factors, such as length of parallel, large number of telephone circuits involved and points of discontinuity within the limits of the parallel, which enter into the problem of determining the proper number of transpositions in both types of circuits. These factors are such as to enforce arbitrary and somewhat inflexible limits, so that this matter of frequency is not the determining factor in setting a limit for the number of transpositions required to obtain mutually non-inductive conditions.

The effectiveness of transpositions at high frequencies was one of the chief questions proposed for experimental investigation on test lines. Such an investigation would be of undoubted scientific interest, but the practical bearing of the subject does not seem to warrant the expense involved, especially as it is expected that the results can be obtained more economically by theoretical study.

Upon completion of the work which has just been discussed, the committee expects to draft a supplementary report to be presented to the California Railroad Commission, giving in detail the conclusions derived from its investigation from the date of its first report, and such recommendations as it feels necessary to make the rules recommended in the former report more complete and explicit than was possible at the time the earlier report was rendered.

From the outset, the investigation has had the support of communication interests with more than state-wide affiliation. On the other hand, upon the power interests of California has fallen almost the entire burden of meeting the power interests' share of the expense. Of late there has been considerable discussion among the California power interests with reference to obtaining the financial support of the similar interests throughout the country. This subject is undoubtedly of far more than local importance and it is to the interest of all parties that the investigation thus began be brought to a state of reasonable completeness.

The organization and equipment of the committee and the unrivaled field for investigation offered by the conditions in California render it desirable that the work be prosecuted to a conclusion in this state. It is the hope of the Joint Committee on Inductive Interference to bring its study, which involves the mutual relationship of the two largest subdivisions of electrical industry, abreast of the present state of development in each of the two arts involved, electrical energy supply and electrical communication.

Discussion of Report.

When Mr. Babcock finished reading his report, President J. J. Carty called for a discussion on the report. The work, he said, represents a sincere effort to bring about the truth and bring about harmonious relations between the power and the telephone interests.

According to A. J. Bowie, electrical engineer at San Francisco, the report indicated the desirability of keeping away from high frequencies on power lines so as to minimize the trouble on telephone lines. He presented oscillograms and proof from a German engineer that oil switches caused more serious high frequency disturbances than air switches, particularly when equipped with horn gaps, the tests having been made by short-circuiting a 10,000 kilowatt generator. The curves show a more gradual rise of voltage and of less magnitude with air-break than with oil-break switches. Mr. Bowie suggested that the lack of definite data on the subject of arcs in air required that further investigations be made before any rules or regulations on the subject are enforced.

A definition of "parallelism" was then requested by J. B. Fisken, superintendent of light and power for the Washington Water Power Co., as a misunderstanding of this term may work a hardship on the power companies. In a series of oscillograph tests the Washington Water Power Co. found that the higher frequencies were not as common with air-break as with oil-break switches. He inquired whether the committee had made any investigation of the effect of killing a charging current on a power line. He suggested that the "bat" which occurs when it was killed, might be due to the condenser discharge from 2,000 insulators on their line. A partial solution to the trouble had been obtained by switching on the low tension side.

J. E. Woodbridge, engineer for Ford, Bacon & Davis, at San Francisco, stated that his experience with oil switches would indicate that inductive interference was due to the fact that the several switches on a three phase line, being independently operated, did not open simultaneously. Consequently the ruling had been made that there should be a mechanical interconnection between the phases of a switch. This disturbance with oil-break switches is a small measure of what is to be found in air-break switches, which require several hundred cycles to operate as compared with the one or two cycles of oil-break switches. The three air arcs do not break simultaneously, thus giving an unbalance, presumably to a much greater degree.

J. P. Jollyman, engineer of electrical construction for the Pacific Gas & Electric Co., stated that this study has pointed out from the power standpoint that the things causing the most trouble are not essential to the operation of power circuits. Consequently the power companies should reasonably be expected to get rid of the non-essentials which harm other people. As the power frequencies of 25, 50 and 60 cycles are much below telephone frequencies, their inductive effect is not so troublesome as from high frequency harmonics which creep into a power system.

He suggested that transformer magnetizing currents might be eliminated by a new system of transformer connections. A matter of great concern is to find out which forms of line construction and transformer connections are preferable, as he suspects that some are better than others. It is necessary to find out how circuits may be mutually built to give the least interference.

E. E. F. Creighton stated that it is impossible to compare oil-break and air-break switches without defining the circuit conditions. An oil break makes sharper and greater disturbances on unbalanced lines, but if transformers are connected so that their natural inductance balances the line capacitance the break takes on a different character. Due consideration should also be given to the phase relation. Continuous interference has come especially from the third, fifth and tenth harmonics (11 or 13 and 17 or 19), which proper transposition will remove.

P. M. Downing, engineer of operation and maintenance for the Pacific Gas & Electric Co., said that the final report had not been entirely satisfactory to either the power or the telephone interests, as it represented a compromise. The report had been criticized because it was indefinite with regard to such matters as parallelisms. The telephone people had been liberal and were not inclined to fix hard and fast rules as to the distance beyond which interference would not be noticeable. Further investigations may or may not enable a clearer definition to be made. The study had resulted in a better understanding of the mutual troubles and should be instrumental in avoiding future parallelisms.

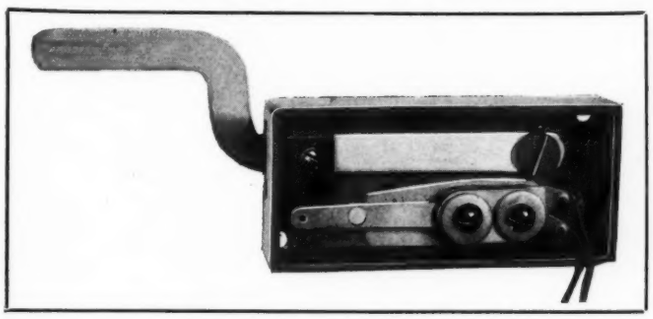
A. H. Griswold, engineer of outside plant, Pacific Telephone & Telegraph Co., urged co-operation among the interests affected.

From Factory and Salesroom

Convention: Independent Telephone Association of America, San Francisco, Cal., October 26-29; National Independent Telephone Association, Chicago, December 8, 9 and 10

Device for Saving Battery Expense.

The S-R Electric Co. has placed a simple and inexpensive, automatic battery cut-out on the market which is designed to save frequent battery renewals in local battery instruments. The increasing price of batteries has caused considerable apprehension on the part of the managers who furnish them to their subscribers. It is claimed that this new device will more than offset this growing expense and will prove to be a real economy for telephone companies who operate party lines.



The S-R Automatic Battery Cut-Out.

It is common experience that almost every circuit has one or more persistent "listeners" on the line. They use up a lot of batteries in a relatively short time and with the common equipment there has been really no effective way of stopping the practice. With this device, however, it is said that a party line subscriber can listen as heretofore, but his batteries are not in circuit until he desires to talk. Thus the telephone company does not have to pay for his pastime.

The S-R automatic battery cut-out consists of an arrangement of contact springs mounted in a small, attractive, gun metal case that is screwed on the outside of the telephone set close to the switch hook. A small lever arm protrudes from this case and can be moved up and down under the switch hook. The shape of the lever arm is such that it can be adapted to any standard type of wall set.

When the receiver is on the hook, the lever arm is pressed down by the switch hook and thereby opens the battery circuit. When the receiver is lifted, the lever arm remains down, thus keeping the batteries out of circuit.

With the receiver up the subscribers can, of course, listen on the line, but they cannot talk until the battery circuit is closed by lifting the lever arm. This may be done with the thumb of the left hand by the same motion with which the receiver is taken off the hook, if an immediate talking connection is desired as, for instance, in answering a call. When listening, to ascertain whether the line is busy or not, the batteries remain out of circuit until the lever arm is raised.

When the talking party hangs up the receiver, the switch hook, presses down the lever arm again and the battery circuit is thereby automatically opened up and remains so until the lever arm is lifted as just described.

Sufficient insulated wire is supplied with the S-R cut-out so that it can be connected with the batteries. This, of course, is done in series and is such a simple matter that anyone can easily attach the device.

Further information may be obtained by addressing the S-R Electric Co., 30 N. LaSalle St., Chicago.

Additions to Stromberg Free Advertising Service.

The Stromberg-Carlson Telephone Mfg. Co., of Rochester, N Y., has added to its free advertising service for telephone companies two neat folders in which are set forth in a convincing manner the many benefits of an Inter-Comm-Phone system to the business establishment. These new folders are well illustrated and are printed on a good quality of paper. A space is provided at the bottom of each of the folders for the imprinting of the telephone company's name.

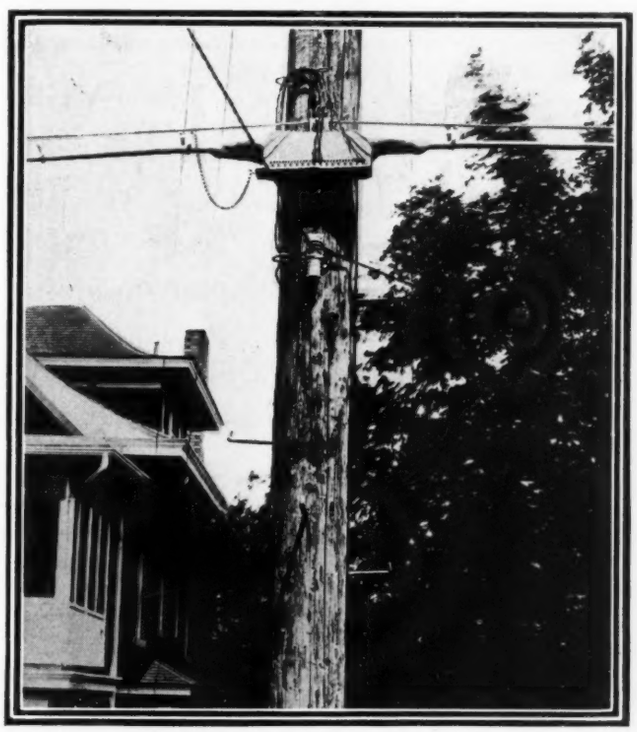
Any telephone company desiring a quantity of these folders may obtain them by applying to the advertising department of the Stromberg-Carlson company.

An Aerial Cable Terminal.

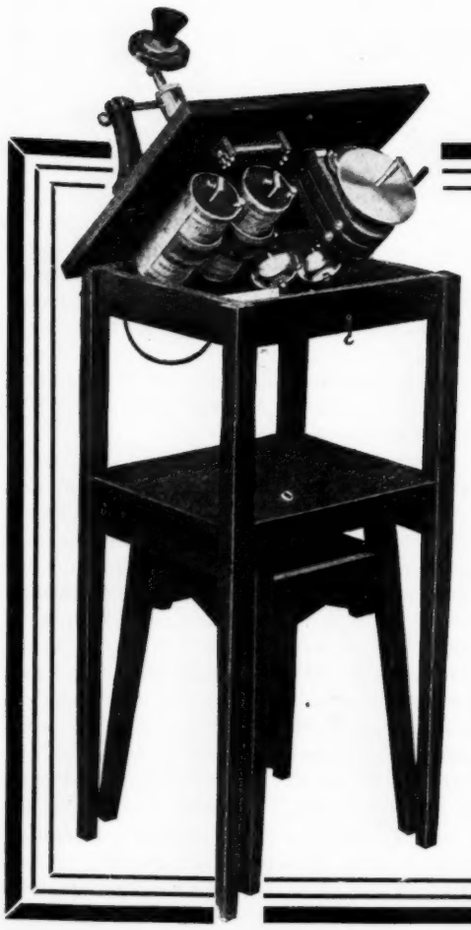
A new type of aerial terminal has been invented by Henry Zipkie, 1903 Avenue J, Brooklyn, N. Y. The accompanying illustration shows it in position on a pole. It is die cast of lead with both outer and inner face plates, through which the locknuts pass. The space is filled with compound thus preventing moisture from entering the sleeve.

The face plates are boiled in linseed oil, tested out with a 20-pound air pressure, and then sealed. There is no moisture condensed on the binding posts and running down the face of the plates. The inventor claims there will be no trouble from snow packing in the terminals and that no terminal tails will be broken from the cable creeping.

The terminal can be split in order to place on existing cables. It can be tied to the messenger and the cable pulled through; also it can be placed at a pole to prevent loops of slack from gathering there. The terminal may, it is stated, be recovered equal to new on reconstruction work. It is said that a third-rate installer cut in four terminals in eight hours, taking but two hours to move and cut in each terminal. In making transfers it is unnecessary to splice out bridle wire.



Cable Terminal in Position on Pole.



—everything convenient

Can be used as a piece of furniture to ornament home or office.
Out of way when not in use.
Not as much trouble to install as a wall telephone.
Very adaptable for a booth set.
Equipped with a complete desk telephone outfit.
Neat in appearance.
Invisible stool.
Every part of telephone easy of access.
Never knocked around, hence lower maintenance expense.
Ten good reasons why you should investigate

The Swedish-American No. 90 Desk Phone

Ask for Catalogue No. 31 and Prices

The Swedish-American Telephone Mfg. Co.
5237 E. Ravenswood Ave.. Chicago, Ill.

IN EVERY important city of North America the Johns-Manville purchaser finds Johns-Manville Service. It exists for his benefit and in order that every J-M Product sold him may render continuous satisfaction.

Where underground systems are compulsory J-M Fibre Conduit is being used more and more every year

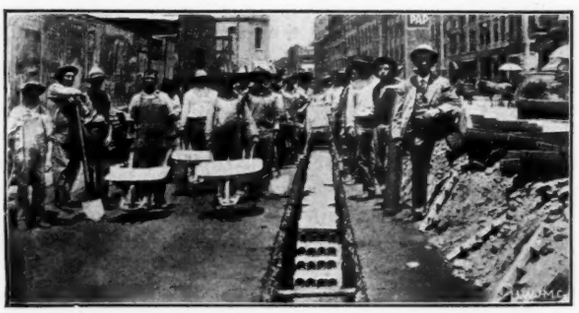
It not only assures a smaller cost, due to its ruggedness and the low breakage loss, but also permits of any duct arrangement or combination.

Those who take the trouble to look into the composition of this conduit in relation to the chemistry of soils can see immediately why it is impervious to such action, and why its life is sure to be long. Let us familiarize you with this product. A sample will be sent where you say.

H. W. Johns-Manville Co.

Atlanta	Cincinnati	Galveston	Memphis	New York	St. Louis
Baltimore	Cleveland	Indianapolis	Milwaukee	Omaha	Salt Lake City
Boston	Columbus	Kansas City	Minneapolis	Philadelphia	San Francisco
Buffalo	Denver	Los Angeles	Newark	Pittsburgh	Seattle
Chicago	Detroit	Louisville	New Orleans	Portland	Toledo

THE CANADIAN H. W. JOHNS-MANVILLE CO., LIMITED
Winnipeg Toronto Montreal Vancouver



Southern California Edison Co. of Los Angeles Installing 50,000 Ft. 3½" J-M Fibre Conduit.

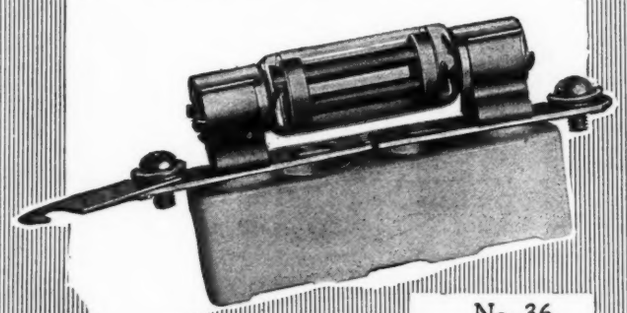
178

BRACH'S Type 36
Vacuum Lightning Arrester

A model of the most efficient form of lightning protection—the VACUUM ARRESTER. Extremely sensitive to all static currents, giving absolute protection to your lines and equipment.
Use them and watch your maintenance charges drop.

Drop Us a Line for Our Catalog and New Prices

L. S. Brach Supply Co.
129 Sussex Ave. Newark, N. J.



No. 36

This is the Glove for
LINEMEN

If you want gloves that will protect your hands from the wear and tear of heavy, rough wire, splinters—and keep soft and pliable—you won't simply ask for "gloves"—you'll buy

GRINNELL REZISTOL GLOVES

Style 4315 P. R. - $2.00 Per Pair

They wear because made of Rezistol tanned horsehide. This leather in special tests has resisted an electric current of 4,000 volts—there is no other leather equal to it. They fit the hands and look neat. Easily kept clean—wash them on your hands either in soap and water, or gasoline, and they'll dry like new.

Get a Pair on Approval.

Your dealer ought to have Grinnell Gloves. Ask him. If he doesn't carry them, send us his name and your size.
Our illustrated booklet, showing various styles, will be sent you—also samples of leather. Whatever glove you select will be sent on approval.

MORRISON-RICKER MFG. CO.
133 Broad Street Grinnell, Iowa

Where cement poles are placed in back yards, six and eleven-pair terminals of this type may be used to great advantage in suburban construction. The terminals may be opened for transfer and tests in wet weather.

Economy is claimed for this type of cable terminal in time, labor and material in installing.

New Tinol Catalog.

Hess & Son, Philadelphia, Pa., are sending to the trade their new Tinol catalog, describing and illustrating their various solder products, including Tinol in tubes or cans, the Tinol torch, soldering outfit, wire, display outfit for dealers, etc.

The manufacturers of Tinol products are prepared to furnish a special Tinol display outfit for dealers. It consists of 12 tubes of paste and six self-acting blow torches. The tubes and one torch are mounted on a neat and attractive counter display card, 16 inches in width.

The Tinol self-acting blow torch is described and illustrated and directions given for its use. General instructions are also given for soldering with Tinol paste, Tinol rod and Tinol wire. Copy of this catalog may be obtained upon request.

Paragraphs.

THE PALMER-MOORE CO., of Syracuse, N. Y., has issued two circulars descriptive and illustrative of its new one-ton model and also its three-quarter ton truck. The one-ton truck, the Palmer-Moore Co. states, is especially designed to meet the demands for a medium capacity truck where great strength and roominess are desired without any considerable increase in expenditure for gasoline and upkeep. Copies of these new circulars may be obtained upon request.

CRACRAFT, LEICH ELECTRIC CO., of Genoa, Ill., has received the contract to furnish the United States Signal Corps 500 portable telephone instruments for camp use.

THE FIBRE CONDUIT CO., of Orangeburg, N. Y., has moved its New York City office from 103 Park avenue to 101 Park avenue, corner of 40th street. This change was made in order to obtain larger quarters, the new quarters being three times the size of the former office.

THE COFFEY SYSTEM & AUDIT CO., of Indianapolis, Ind., is installing the Coffey system of accounting for the Fountain Telephone Co., at Covington, Ind. The company is also making the quarterly audit for the Logansport Home Telephone Co., of Logansport, and the Home Telephone Co., of Angola, Ind.

THE YAWMAN & ERBE MFG. CO., of Rochester, N. Y., is mailing to the trade the September issue of its live house organ, "The 'Y and E' Idea," featuring its new line of efficiency desks. The company has also just issued a new and attractive booklet on "The Proper Place for Blueprints and Drawings," pointing out the merits of the Y and E vertical cabinet. Copies of this booklet and also the Y and E house organ may be obtained upon request.

Economy Practiced in British Telephone Service.

The British government is practicing economy in the telephone service as a result of the new extensions made necessary since the war for official purposes and the sadly-depleted engineering staff. It is in compliance with a treasury ruling that the postmaster general announces as little new telephone extension work as possible will be done at present so far as the public is concerned.

The war loan and other features of this war have taxed the telephone service heavily, many additional offices having to be equipped with telephones and switchboards. New installations for public service are restricted to those actually necessary and not making too large a demand on the depleted working staffs. The Times says that just now an application for an extension of telephone work must have a good case to support it.

REBUILT BARGAINS

Dean Electric Co. 3-bar 1000 ohm bridging hotel sets	$3.75
Dean Electric Co. 3-bar 1000 ohm bridging common battery type magneto wall set	4.35
Vote Berger 3-bar 1000 ohm bridging common battery type magneto wall set	4.20
Central Telephone & Electric Co. 3-bar 1000 ohm bridging compacts	4.40
Central Telephone & Electric Co. 4-bar 1000 ohm bridging compacts @ $5.00, 1600 ohms	5.50
Monarch No. 22 type 3-bar 1000 ohm bridging desk sets	5.80
Dean Electric Co. No. 2315 direct current common battery Bull Neck desk sets, straight line $4.75, harmonic	5.25
Kellogg No. 631 straight line common battery steel hotel set @ $4.00, harmonic	5.00
Stromberg-Carlson local or common battery triplet sets, complete with No. 1 transmitter, No. 3 receiver, switch-hook and induction coil	2.00
New hand generator cabinets, 3 or 4-bar size 25c, 5 bar	.30
Kellogg No. 186 common battery straight line oak hotel set	3.75
Western Electric Co. No. 22, 2 or 3-bar bridging hand generators	1.00
Cook's copper self-welding wire joints for No. 10 wire	.01
Western Electric Co. No. 38A 1000 ohm self-contained ringers, complete with 3-inch gongs	1.00
International 3-bar 1000 ohm bridging compacts	4.25
Stromberg-Carlson 3-bar direct current generators	1.00
Kellogg No. 4 type 3-bar 90 ohm series desk sets (2 piece outfit), complete, less batteries, $5.25; bridging 3-bar 1000 ohm	5.60
Dean Electric Co. No. 6775 balance coil type common battery straight line oak hotel sets, $3.75; harmonic	4.50
No. 1 glass knobs, size 1½x1½ inches, per 100, 60c; lots of 1,000	5.00
Kellogg No. 17 receivers	.80
INDEPENDENT SHIELD SIGNS	
Large steel shield signs, enameled in three colors, size 17x18 inches, lettered "Home, Local and Long Distance Telephone Company," lots less than one dozen, each	$0.50
Dozen lots, or over, each	.40
Small steel shield signs, enameled in three colors, size 8x18 inches, lettered "Home, Local and Long Distance Telephone," "Telephone Pay Station," lots less than one dozen, each	.40
Dozen lots, or over, each	.35

Rebuilt Telephone Equipment Co.
2127-2129 W. 21st St. CHICAGO, ILL.

You Should Have a Copy of Our NEW CATALOG of

Klein's Improved Haven's Grip

KLEIN TOOLS

(Just off the Press)

Sent to You on Request

Filled with illustrations, descriptions and prices. —A very convenient booklet to have on hand at all times. Every telephone company manager and purchasing agent should have a copy. Write for it.

Mathias Klein & Sons
Canal Station 34 Chicago, Illinois
Sales Representatives

THE WASSON REEL

A Great Time and Labor Saver for Telephone and Electric Light and Power Use

With Insulated Handles

Make Your Poles Last at Least 14 Years

Instead of putting up new poles every seven years, use Reeves Wood Preserver and double the life of your timbers. This wonderful fluid penetrates the wood and hardens there. Keeps out the germs of moisture and decay. Over 75% cold tar creosote.

REEVES WOOD PRESERVER

is easy to apply—requires no heating or special apparatus. A bucket and brush or a dipping vat will do.

TESTING OUTFIT—FREE

If you are interested in reducing the cost of construction and making timbers last longer, send for this outfit and see for yourself how the Preserver penetrates the wood, hardening there and keeping out moisture.

THE REEVES CO., Mfrs., New Orleans

Treating Poles with Reeves Wood Preserve

Why sacrifice your old equipment for new?

Don't imagine that because some of the parts are commencing to wear that you must replace?

"We can save you money" because we can repair your apparatus—or replace worn out parts, and will guarantee you satisfaction.

At least when you are situated that it must either be "old" or "new" apparatus let us show how the old can be continued serviceable. **Pack up your parts, whether one or twenty pieces, and ship to the**

Suttle Equipment Company
Olney, Ill.

The Anchor that is making good where all others have failed

THE FAULTLESS ANCHOR CO., Fostoria, O